

Министерство науки и высшего образования Российской Федерации
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«Национальный исследовательский университет ИТМО»

Факультет инфокоммуникационных технологий

ОТЧЕТ
ПО ЛАБОРАТОРНОЙ РАБОТЕ №5
тема: Процедуры, функции, триггеры в PostgreSQL.
дисциплина: «ПРОЕКТИРОВАНИЕ И РЕАЛИЗАЦИЯ БАЗ ДАННЫХ»

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Цель: 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.

Оборудование: компьютерный класс.

Программное обеспечение: СУБД MongoDB 5.0.8.

Вывод

Практическое задание 8.1.1:

```
"totalSize" : 0,
"indexes" : 0,
"indexSize" : 0,
"scaleFactor" : 1,
"fileSize" : 0,
"fsUsedSize" : 0,
"fsTotalSize" : 0,
"ok" : 1
}
> use learn
switched to db learn
> db.stats()
{
  "db" : "learn",
  "collections" : 0,
  "views" : 0,
  "objects" : 0,
  "avgObjSize" : 0,
  "dataSize" : 0,
  "storageSize" : 0,
  "totalSize" : 0,
  "indexes" : 0,
  "indexSize" : 0,
  "scaleFactor" : 1,
  "fileSize" : 0,
  "fsUsedSize" : 0,
  "fsTotalSize" : 0,
  "ok" : 1
}
```

Создание БД

```

> db.unicorn.find({name: 'Aurora'});
> db.unicorn.find({name: 'Horny'});
> db.unicorn.find({name: 'Horny'})
> db.unicorn.find({name: "Horny"})
> db.unicorn.find({weight: 600})
> db.unicorn.find({weight: $gt:600})
uncaught exception: SyntaxError: missing } after property list :
@(shell):1:28
> db.unicorn.find({weight: {$gt:600}})
> db.find({weight: {$gt:600}})
uncaught exception: TypeError: db.find is not a function :
@(shell):1:1
> db.unicorns.find({weight: {$gt:600}})
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984,
  "gender" : "m", "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
> db.unicorns.find({name: "Horny"})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
> db.unicorns.find({name: 'Aurora'});
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
>

```

Заполнение и поиск

```

document = {name: 'Dunx', loves: ['grape', 'watermelon'], weight: 704, gender: 'm', vampires: 165}

{
  "name" : "Dunx",
  "loves" : [
    "grape",
    "watermelon"
  ],
  "weight" : 704,
  "gender" : "m",
  "vampires" : 165
}

db.stats()

{
  "db" : "learn",
  "collections" : 1,
  "views" : 0,
  "objects" : 11,
  "avgObjSize" : 125.9090909090909,
  "dataSize" : 1385,
  "storageSize" : 36864,
  "indexes" : 1,
  "indexSize" : 36864,
  "totalSize" : 73728,
  "scaleFactor" : 1,
}

```

Заполнение альтернативным способом

Практическое задание 8.1.2:

```

> db.unicorns.find({gender:'m'}).sort({name:1})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Roooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
>

```

Для самцов

```

db.unicorns.find({gender:'f'}).sort({name:1}).limit(3)
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }

```

Для самок

```
> db.unicorns.findOne({gender:'f', loves: 'carrot'})
{
  "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"),
  "name" : "Aurora",
  "loves" : [
    "carrot",
    "grape"
  ],
  "weight" : 450,
  "gender" : "f",
  "vampires" : 43
}
```

Самка, которая любит морковь

Практическое задание 8.1.3:

```
> db.unicorns.find({gender:'m'}, {loves:0, gender:0})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "weight" : 600, "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "weight" : 984, "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "weight" : 575, "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "weight" : 690, "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "weight" : 421, "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "weight" : 650, "vampires" : 54 }
```

Список самцов без пола и предпочтениях

Практическое задание 8.1.4:

```
> db.unicorns.find().sort({$natural:-1})
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
```

Список единорогов в обратном порядке добавления

Практическое задание 8.1.5:

```
> db.unicorns.find({}, {loves:{$slice:1}, _id:0})
{ "name" : "Horny", "loves" : [ "carrot" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
{ "name" : "Aurora", "loves" : [ "carrot" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "name" : "Unicrom", "loves" : [ "energon" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
{ "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "name" : "Solnara", "loves" : [ "apple" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "name" : "Ayna", "loves" : [ "strawberry" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "name" : "Kenny", "loves" : [ "grape" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "name" : "Raleigh", "loves" : [ "apple" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "name" : "Leia", "loves" : [ "apple" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "name" : "Pilot", "loves" : [ "apple" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "name" : "Nimue", "loves" : [ "grape" ], "weight" : 540, "gender" : "f" }
```

Список единорогов с названием первого предпочтения исключив идентификатор

Практическое задание 8.1.6:

```
> db.unicorns.find({gender:'f',weight:{>:500,<:700}}, {_id:0})
{ "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
```

Список самок с весом от 500кг до 700кг исключив идентификатор

Практическое задание 8.1.7:

```
> db.unicorns.find({gender:'m',weight:{>:500},loves:{>all:['grape','lemon']}}, {_id:0})
{ "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
```

Список самцов с весом от 500кг, с предпочтениями grape, lemon, исключив идентификатор

Практическое задание 8.1.8:

```
> db.unicorns.find({vampires:{>exists:false}})
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
```

Единороги, не имеющие ключ vampires

Практическое задание 8.1.9:

```
> db.unicorns.find({gender:'m'},{loves:{>slice:1}}).sort({name:1})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "apple" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooodooles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
```

Упорядоченный список самцов с их первым предпочтением

Практическое задание 8.2.1:

```
> db.towns.find({"mayor.party":"'I'},{name:1, mayor:1,_id:0})
{ "name" : "New York", "mayor" : { "name" : "Michael Bloomberg", "party" : "I" } }
```

Список городов с независимыми мэрами

```
> db.towns.find({"mayor.party":{">exists:false}},{name:1, mayor:1,_id:0})
{ "name" : "Punxsutawney ", "mayor" : { "name" : "Jim Wehrle" } }
```

Список городов с мэрами без партий

Практическое задание 8.2.2:

```
> f=function() {return this.gender=="m";}
function() {return this.gender=="m";}
```

Создание функции

```
> var cursor = db.unicorns.find({gender:"m"}); null
null
> cursor.sort({name:1}).limit(2);null;
null
> cursor.forEach(function(f) {print(f.name);})
Horny
Kenny
>
```

Создание и использование курсора

Практическое задание 8.2.3:

```
> db.unicorns.find({gender:'f', weight:{$gt:500,$lt:600}}).count()
2
> _
```

Количество самок весом от 500 до 600кг

Практическое задание 8.2.4:

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

Список предпочтений

Практическое задание 8.2.5:

```
> db.unicorns.aggregate({'$group':{'_id':'$gender', count:{$sum:1}}})
{ "_id" : "m", "count" : 6 }
{ "_id" : "f", "count" : 5 }
> _
```

Количество единорогов обоих полов

Практическое задание 8.2.6:

```
> db.unicorns.save({name: 'Barney', loves: ['grape'],
... weight: 340, gender: 'm'})
WriteResult({ "nInserted" : 1 })
> db.unicorns.find()
db.unicorns.find()
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m",
  "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f",
  "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m",
  "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m" }
```

Практическое задание 8.2.7:

```
> db.unicorns.update({name:'Ayna'}, {name:'Ayna', loves:['strawberry','lemon'],weight:800,gend:'f',vampires:51})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.unicorns.find()
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m",
  "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f",
  "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m",
  "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f",
  "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 800, "gender" : "f",
  "vampires" : 51 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "apple", "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m" }
>
```

Изменения для Ayna

Практическое задание 8.2.8:

```
> db.unicorns.update({name:'Raleigh',gender:'m'}, {$set:{loves:'redbull'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.unicorns.find()
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m",
  "vampires" : 63 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f",
  "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m",
  "vampires" : 182 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f",
  "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 800, "gender" : "f",
  "vampires" : 51 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : "redbull", "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m" }
```

Изменения для Raleigh

Практическое задание 8.2.9:

```
> db.unicorns.updateMany({gender:"m"},{$inc:{vampires:5}})
{ "acknowledged" : true, "matchedCount" : 7, "modifiedCount" : 7 }
> db.unicorns.find({gender:'m'})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m",
  "vampires" : 68 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m",
  "vampires" : 187 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : "redbull", "weight" : 421, "gender" : "m", "vampires" : 7 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m", "vampires" : 5 }
```

Увеличить количество убитых вампиров на 5 для самцов

Практическое задание 8.2.10:


```
> db.towns.update({name:'Portland'}, {$unset:{mayor.party: "D"}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.towns.find()
{ "_id" : ObjectId("62b20d77e0a622c6adcd1d67"), "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("62b20da2e0a622c6adcd1d68"), "name" : "Portland", "populatiuon" : 528000, "last_sensus" : ISODate("2009-07-20T00:00:00Z"), "famous_for" : [ "beer", "food" ], "mayor" : { "name" : "Sam Adams" } }
{ "_id" : ObjectId("62b20f28e0a622c6adcd1d69"), "name" : "Punxsutawney ", "populatiuon" : 6200, "last_sensus" : ISODate("2008-01-31T00:00:00Z"), "famous_for" : [ "" ], "mayor" : { "name" : "Jim Wehrle" } }
>
```

Изменение для Portland

Практическое задание 8.2.11:

```
> db.unicorns.update({name:'Pilot', gender:'m'},{$push:{loves:'chocolate'}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.unicorns.find()
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 68 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 800, "gend" : "f", "vampires" : 51 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : "redbull", "weight" : 421, "gender" : "m", "vampires" : 7 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m", "vampires" : 5 }
>
```

Изменение для Pilot

Практическое задание 8.2.12:

```
> db.unicorns.update({name:'Aurora',gender:'f'},{$addToSet:{loves:{each:['sugar','lemon']}}})
WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
> db.unicorns.find()
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 68 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape", "sugar", "lemon" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d60"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "weight" : 800, "gend" : "f", "vampires" : 51 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : "redbull", "weight" : 421, "gender" : "m", "vampires" : 7 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("62b36f12e0a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m", "vampires" : 5 }
>
```

Изменение для Ауорога

Практическое задание 8.2.13:

```
> db.towns.remove({'mayor.party':{$exists:false}})
WriteResult({ "nRemoved" : 2 })
> db.towns.find()
{ "_id" : ObjectId("62b20d77e0a622c6adcd1d67"), "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" } }
>
```

Удаление города с беспартийным мэром


```

> db.towns.remove({})
WriteResult({ "nRemoved" : 1 })
> show collections
towns
unicorns
> db.towns.find()

```

Очистка коллекции

Практическое задание 8.3.1:

```

> db.zones.insert({_id:'spb', name:'saint-p', descr:'bla bla bla'})
WriteResult({ "nInserted" : 1 })
> db.zones.insert({_id:'msc', name:'moscow', descr:'bla bla bla'})
WriteResult({ "nInserted" : 1 })
> db.zones.find()
{ "_id" : "spb", "name" : "saint-p", "descr" : "bla bla bla" }
{ "_id" : "msc", "name" : "moscow", "descr" : "bla bla bla" }
>

```

Создание зон обитания

```

> db.unicorns.updateMany({gender:'f',{ $set:{zone:{ $ref:'zones', $id:'spb' }}}})
...
...
> db.unicorns.find({gender:'f'})
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape", "sugar", "lemon" ], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
> db.unicorns.updateMany({gender:'f',{ $set:{zone:{ $ref:'zones', $id:'spb' }}}})
{ "acknowledged" : true, "matchedCount" : 4, "modifiedCount" : 4 }
> db.unicorns.find({gender:'f'})
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5c"), "name" : "Aurora", "loves" : [ "carrot", "grape", "sugar", "lemon" ], "weight" : 450, "gender" : "f", "vampires" : 43, "zone" : DBRef("zones", "spb") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5f"), "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80, "zone" : DBRef("zones", "spb") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d63"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33, "zone" : DBRef("zones", "spb") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d65"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f", "zone" : DBRef("zones", "spb") }
> db.unicorns.updateMany({gender:'m',{ $set:{zone:{ $ref:'zones', $id:'msc' }}}})
{ "acknowledged" : true, "matchedCount" : 7, "modifiedCount" : 7 }
> db.unicorns.find({gender:'m'})
{ "_id" : ObjectId("62b1f97fe0a622c6adcd1d5b"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 68, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5d"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d5e"), "name" : "Rooodoodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d61"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d62"), "name" : "Raleigh", "loves" : [ "redbull", "weight" : 421, "gender" : "m", "vampires" : 7, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b1f98ce0a622c6adcd1d64"), "name" : "Pilot", "loves" : [ "apple", "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59, "zone" : DBRef("zones", "msc") }
{ "_id" : ObjectId("62b36f1e9a622c6adcd1d6a"), "name" : "Barney", "loves" : [ "grape" ], "weight" : 340, "gender" : "m", "vampires" : 5, "zone" : DBRef("zones", "msc") }
>

```

Добавление ссылок на зоны

Практическое задание 8.3.2:

```

> db.unicorns.createIndex({"name":1},{ "unique":true})
{
  "numIndexesBefore" : 1,
  "numIndexesAfter" : 2,
  "createdCollectionAutomatically" : false,
  "ok" : 1
}
> db.unicorns.insert({name:'Horny'})
WriteResult({
  "nInserted" : 0,
  "writeError" : {
    "code" : 11000,
    "errmsg" : "E11000 duplicate key error collection: learn.unicorns index: name_1 dup key: { name: \"Horny\" }"
  }
})
>

```

Создание индекса

Практическое задание 8.3.3:

```

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

```

Удалить индекс кроме идентификатора

```

> db.unicorns.dropIndex('_id_')
{
  "ok" : 0,
  "errmsg" : "cannot drop _id index",
  "code" : 72,
  "codeName" : "InvalidOptions"
}

```

Попытка удалить индекс идентификатора

Практическое задание 8.3.4

```

> db.createCollection('numbers')
{ "ok" : 1 }
> for(i=0;i<100000;i++){db.numbers.insert({value:i})}
WriteResult({ "nInserted" : 1 })
> db.numbers.find().sort({$natural:-1}).limit(4)
{ "_id" : ObjectId("62b393d0e0a622c6adcea40f"), "value" : 99999 }
{ "_id" : ObjectId("62b393d0e0a622c6adcea40e"), "value" : 99998 }
{ "_id" : ObjectId("62b393d0e0a622c6adcea40d"), "value" : 99997 }
{ "_id" : ObjectId("62b393d0e0a622c6adcea40c"), "value" : 99996 }

```

Создание, заполнение коллекции и показ последних 4х элементов

```

C:\Program Files\MongoDB\Server\5.0\bin\mongo.exe
db.numbers.explain("executionStats").find().sort((value:-1)).limit(4)
{
  "explainVersion" : "1",
  "queryPlanner" : {
    "namespace" : "learn.numbers",
    "indexFilterSet" : false,
    "parsedQuery" : {
      "stage" : "COLLSCAN",
      "direction" : "forward"
    },
    "rejectedPlans" : [ ]
  },
  "executionStats" : {
    "executionSuccess" : true,
    "nReturned" : 4,
    "executionTimeMillis" : 82,
    "totalKeysExamined" : 0,
    "totalDocsExamined" : 100000,
    "executionStages" : {
      "stage" : "SORT",
      "nReturned" : 4,
      "executionTimeMillisEstimate" : 3,
      "works" : 100002,
      "advanced" : 4,
      "needTime" : 100002,
      "needYield" : 0,
      "saveState" : 100,
      "restoreState" : 100,
      "isEOF" : 1,
      "sortPattern" : {
        "value" : -1
      },
      "memLimit" : 104857600,
      "limitAmount" : 4,
      "type" : "simple",
      "totalDataSizeSorted" : 69000000,
      "usedDisk" : false,
      "inputStage" : {
        "stage" : "COLLSCAN",
        "nReturned" : 100000,
        "executionTimeMillisEstimate" : 2,
        "works" : 100002,
        "advanced" : 100000,
        "needTime" : 1,
        "needYield" : 0,
        "saveState" : 100,
        "restoreState" : 100,
        "isEOF" : 1,
        "direction" : "forward",
        "docsExamined" : 100000
      }
    }
  },
  "command" : {
    "find" : "numbers",
    "filter" : {
      "value" : -1
    },
    "limit" : 4,
    "singleBatch" : false,
    "sort" : {
      "value" : -1
    },
    "$db" : "learn"
  },
  "serverInfo" : {
    "host" : "DESKTOP-21S98B9",
    "port" : 27017,
    "version" : "5.0.9",
    "gitVersion" : "6f7dae919422dc7f4892c10ff20dc721ad00e6"
  },
  "serverParameters" : {
    "internalQueryFacetBufferSizeBytes" : 104857600,
    "internalQueryFacetMaxOutputDocSizeBytes" : 104857600,
    "internalLookupStageIntermediateDocumentMaxSizeBytes" : 104857600,
    "internalDocumentSourceGroupMaxMemoryBytes" : 104857600,
    "internalQueryMaxLockingSortMemoryUsageBytes" : 104857600,
    "internalQueryProhibitBlockingMergeOnMongo" : 0,
    "internalQueryMaxAddToSetBytes" : 104857600,
    "internalDocumentSourceSetWindowFieldsMaxMemoryBytes" : 104857600
  },
  "ok" : 1
}
```

```

C:\Program Files\MongoDB\Server\5.0\bin\mongo.exe
{
  "type" : "simple",
  "totalDataSizeSorted" : 69000000,
  "usedDisk" : false,
  "inputStage" : {
    "stage" : "COLLSCAN",
    "nReturned" : 100000,
    "executionTimeMillisEstimate" : 2,
    "works" : 100002,
    "advanced" : 100000,
    "needTime" : 1,
    "needYield" : 0,
    "saveState" : 100,
    "restoreState" : 100,
    "isEOF" : 1,
    "direction" : "forward",
    "docsExamined" : 100000
  }
},
  "command" : {
    "find" : "numbers",
    "filter" : {
      "value" : -1
    },
    "limit" : 4,
    "singleBatch" : false,
    "sort" : {
      "value" : -1
    },
    "$db" : "learn"
  },
  "serverInfo" : {
    "host" : "DESKTOP-21S98B9",
    "port" : 27017,
    "version" : "5.0.9",
    "gitVersion" : "6f7dae919422dc7f4892c10ff20dc721ad00e6"
  },
  "serverParameters" : {
    "internalQueryFacetBufferSizeBytes" : 104857600,
    "internalQueryFacetMaxOutputDocSizeBytes" : 104857600,
    "internalLookupStageIntermediateDocumentMaxSizeBytes" : 104857600,
    "internalDocumentSourceGroupMaxMemoryBytes" : 104857600,
    "internalQueryMaxLockingSortMemoryUsageBytes" : 104857600,
    "internalQueryProhibitBlockingMergeOnMongo" : 0,
    "internalQueryMaxAddToSetBytes" : 104857600,
    "internalDocumentSourceSetWindowFieldsMaxMemoryBytes" : 104857600
  },
  "ok" : 1
}
```

Вывод:

В ходе работы были получены практические навыки работы с CRUD - операциями, с вложенными объектами в коллекции базы данных MongoDB, агрегации и изменения данных, с ссылками и индексами в базе данных MongoDB.