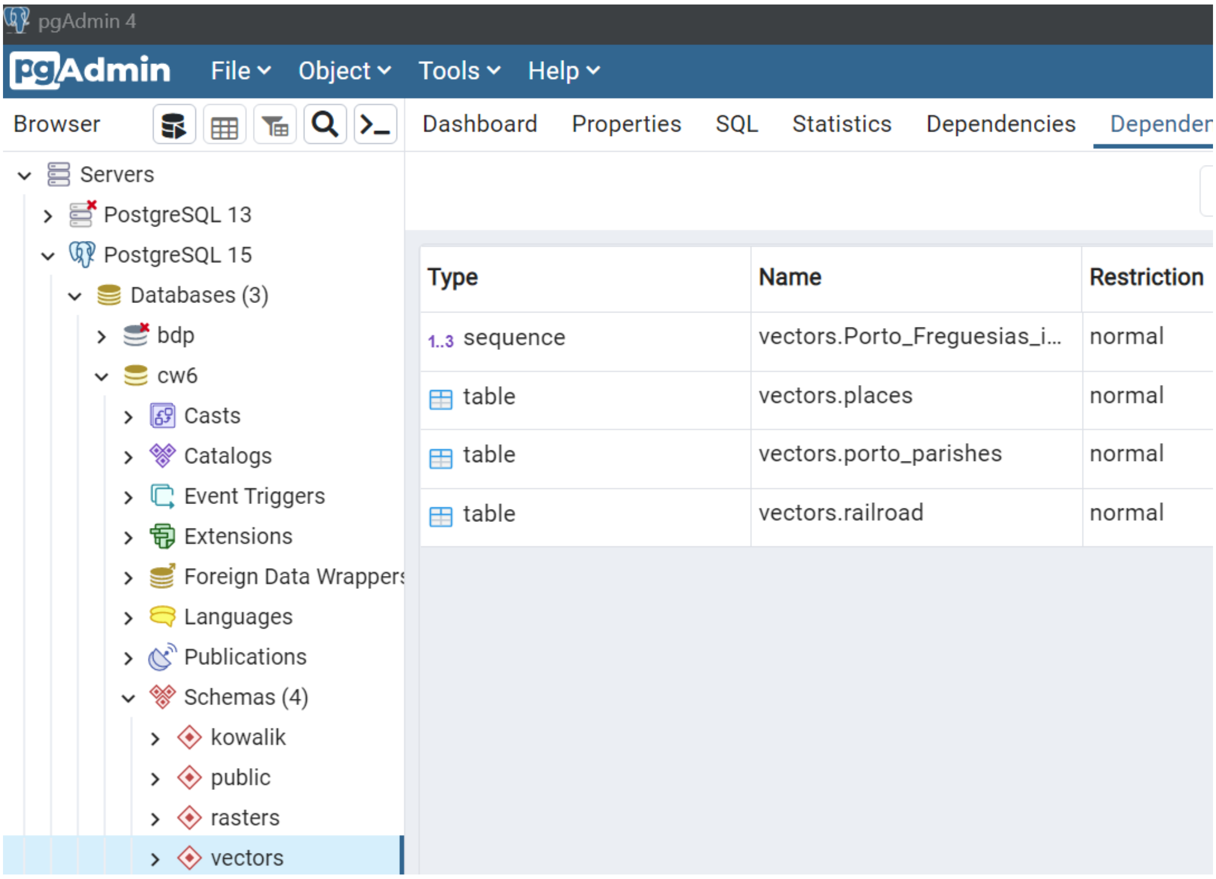
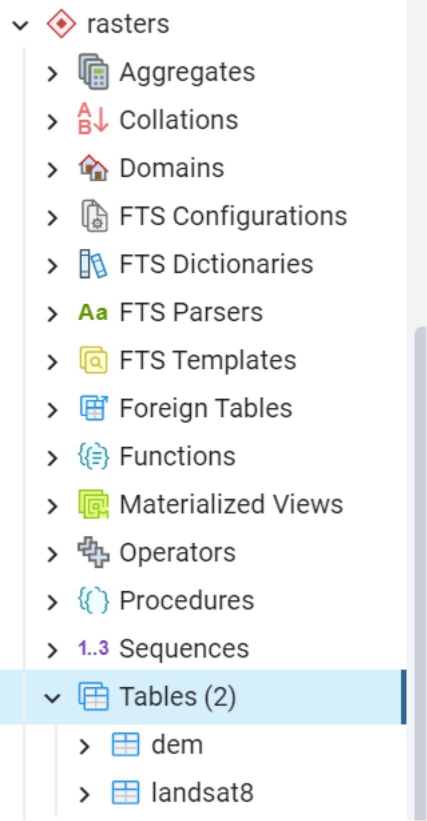
nowa baza danych i struktura bazy danych



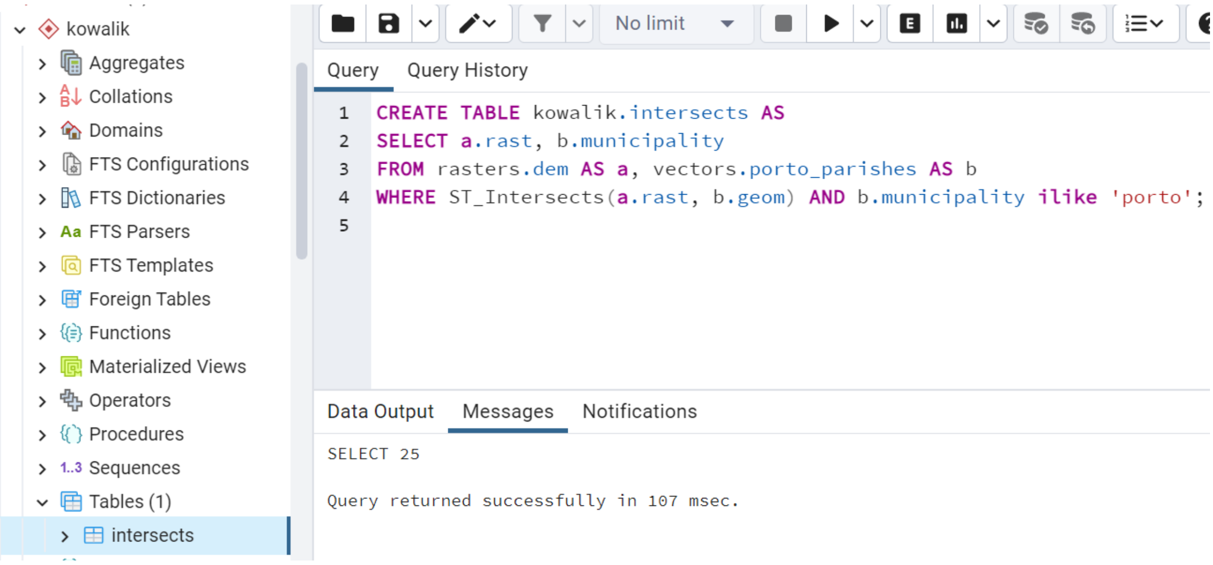
Type	Name	Restriction
1..3 sequence	vectors.Porto_Freguesias_i...	normal
table	vectors.places	normal
table	vectors.porto_parishes	normal
table	vectors.railroad	normal

Ładowanie danych rastrowych



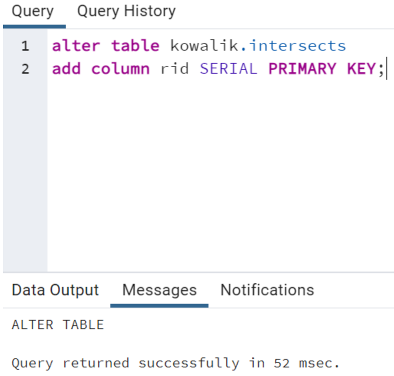
Tworzenie rastrów z istniejących rastrów i interakcja z wektorami

Przykład 1 - ST_Intersects



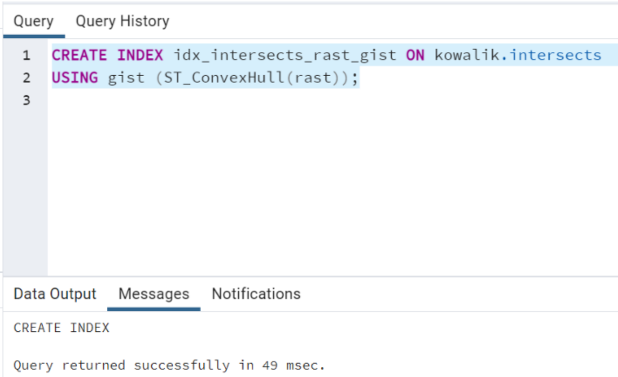
```sql
CREATE TABLE kowalik.intersects AS
SELECT a.rast, b.municipality
FROM rasters.dem AS a, vectors.porto_parishes AS b
WHERE ST_Intersects(a.rast, b.geom) AND b.municipality ilike 'porto';
```

```
SELECT 25

Query returned successfully in 107 msec.
```



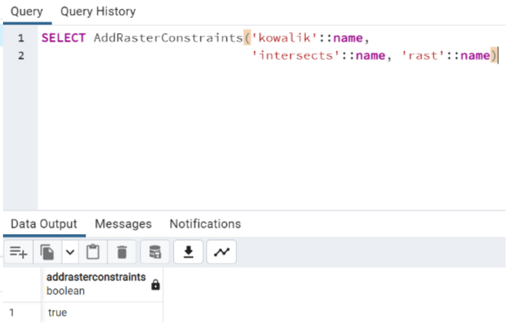
```sql
alter table kowalik.intersects
add column rid SERIAL PRIMARY KEY;
```

```
ALTER TABLE

Query returned successfully in 52 msec.
```



```sql
CREATE INDEX idx_intersects_rast_gist ON kowalik.intersects
USING gist (ST_ConvexHull(rast));
```

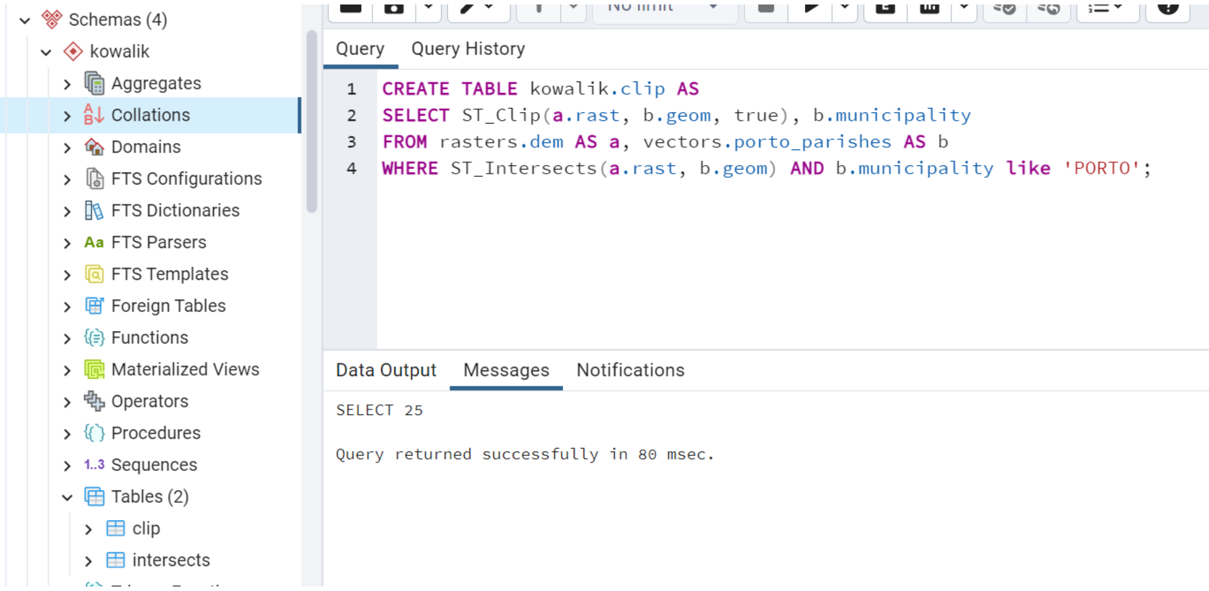
```
CREATE INDEX

Query returned successfully in 49 msec.
```



```sql
SELECT AddRasterConstraints('kowalik'::name,
                            'intersects'::name, 'rast'::name)
```

	addrasterconstraints boolean
1	true

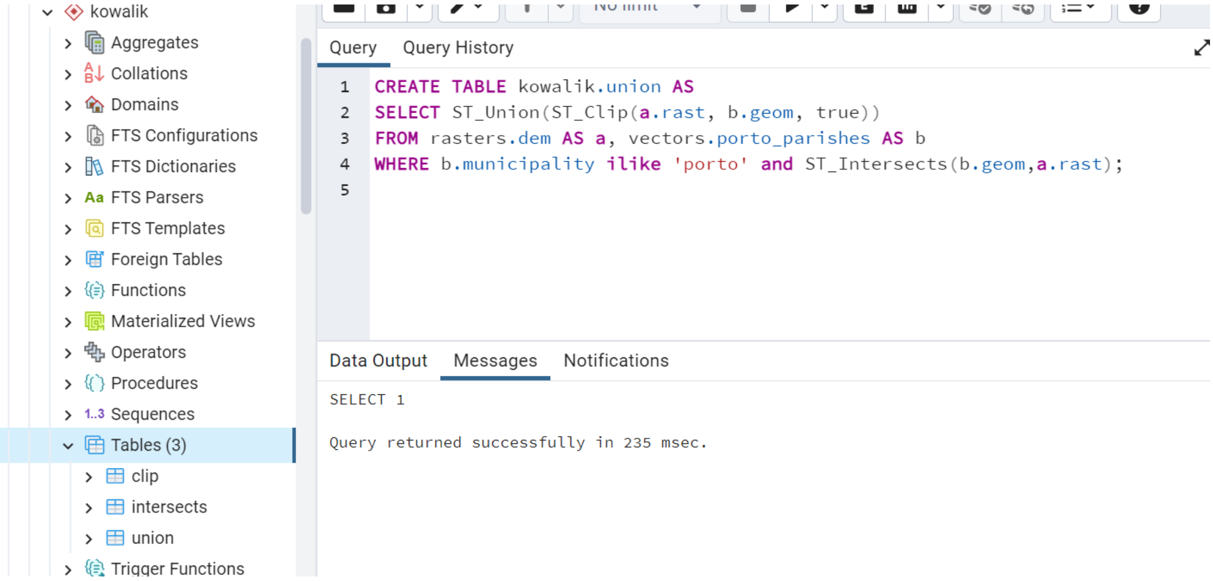
Przykład 2 - ST_Clip



```sql
CREATE TABLE kowalik.clip AS
SELECT ST_Clip(a.rast, b.geom, true), b.municipality
FROM rasters.dem AS a, vectors.porto_parishes AS b
WHERE ST_Intersects(a.rast, b.geom) AND b.municipality like 'PORTO';
```

```
SELECT 25

Query returned successfully in 80 msec.
```

Przykład 3 - ST_Union

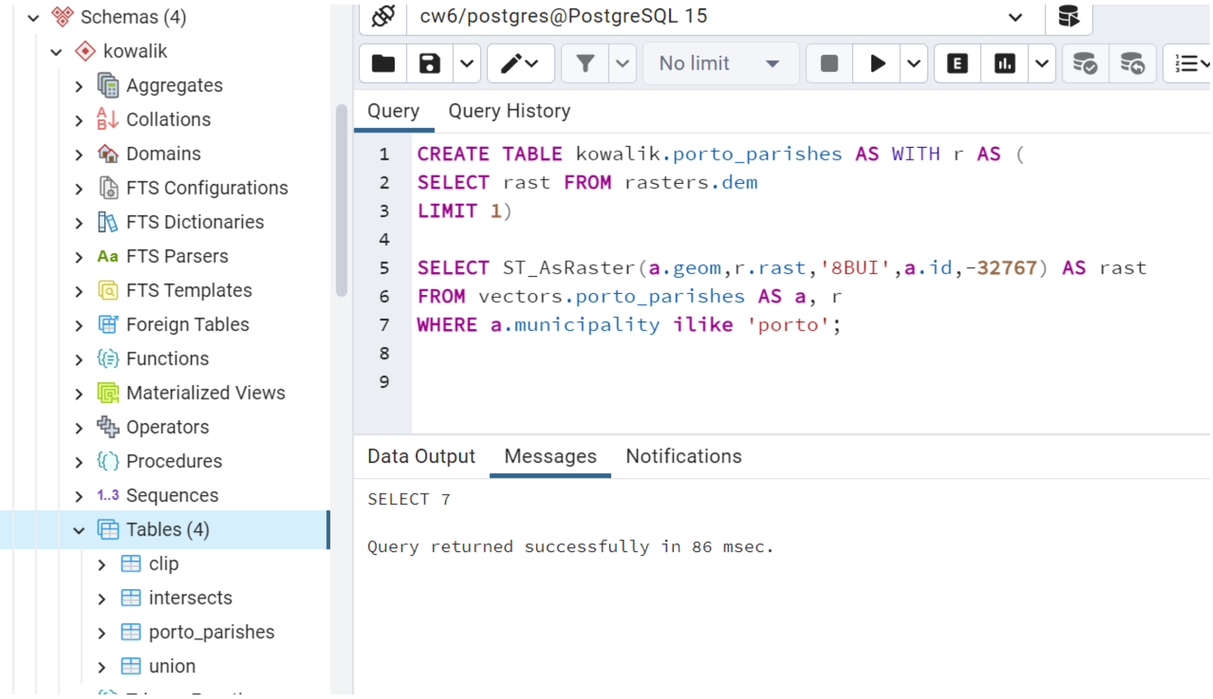


```sql
CREATE TABLE kowalik.union AS
SELECT ST_Union(ST_Clip(a.rast, b.geom, true))
FROM rasters.dem AS a, vectors.porto_parishes AS b
WHERE b.municipality ilike 'porto' and ST_Intersects(b.geom,a.rast);
```

```
SELECT 1

Query returned successfully in 235 msec.
```

Tworzenie rastrów z wektorów (rastrowanie)

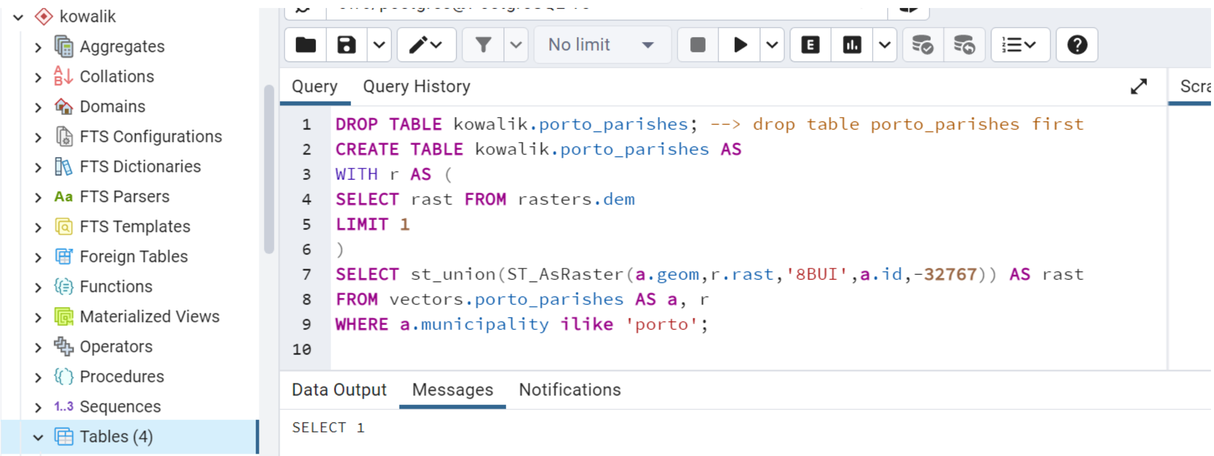
Przykład 1 - ST_AsRaster



```sql
CREATE TABLE kowalik.porto_parishes AS WITH r AS (
SELECT rast FROM rasters.dem
LIMIT 1)

SELECT ST_AsRaster(a.geom,r.rast,'8BUI',a.id,-32767) AS rast
FROM vectors.porto_parishes AS a, r
WHERE a.municipality ilike 'porto';
```

```
SELECT 7

Query returned successfully in 86 msec.
```

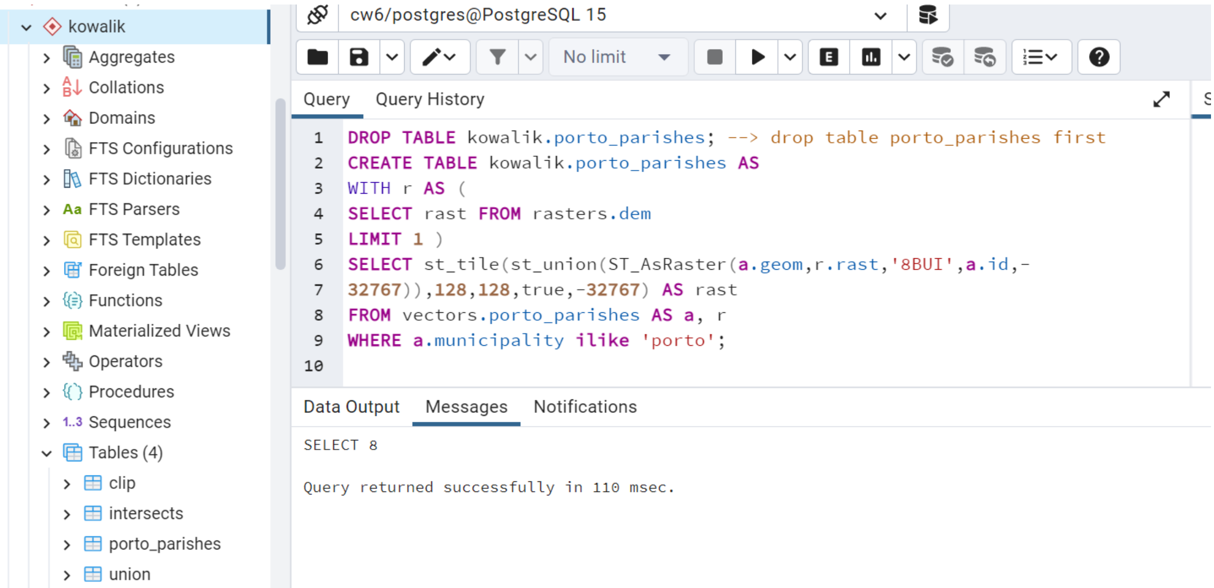
Przykład 2 - ST_Union



```sql
DROP TABLE kowalik.porto_parishes; --> drop table porto_parishes first
CREATE TABLE kowalik.porto_parishes AS
WITH r AS (
SELECT rast FROM rasters.dem
LIMIT 1
)
SELECT st_union(ST_AsRaster(a.geom,r.rast,'8BUI',a.id,-32767)) AS rast
FROM vectors.porto_parishes AS a, r
WHERE a.municipality ilike 'porto';

```

```
SELECT 1
```

Przykład 3 - ST_Tile

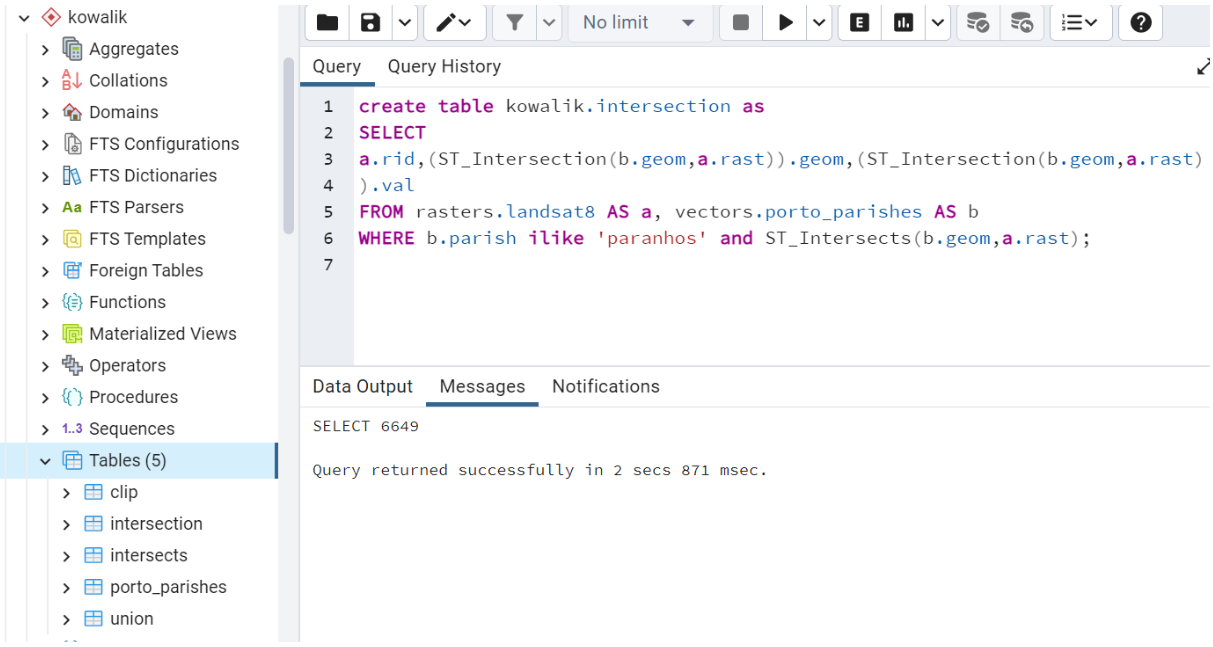


```
DROP TABLE kowalik.porto_parishes; --> drop table porto_parishes first
CREATE TABLE kowalik.porto_parishes AS
WITH r AS (
SELECT rast FROM rasters.dem
LIMIT 1 )
SELECT st_tile(st_union(ST_AsRaster(a.geom,r.rast,'8BUI',a.id,-
32767)),128,128,true,-32767) AS rast
FROM vectors.porto_parishes AS a, r
WHERE a.municipality ilike 'porto';
```

```
SELECT 8

Query returned successfully in 110 msec.
```

Konwertowanie rastrów na wektory (wektoryzowanie)

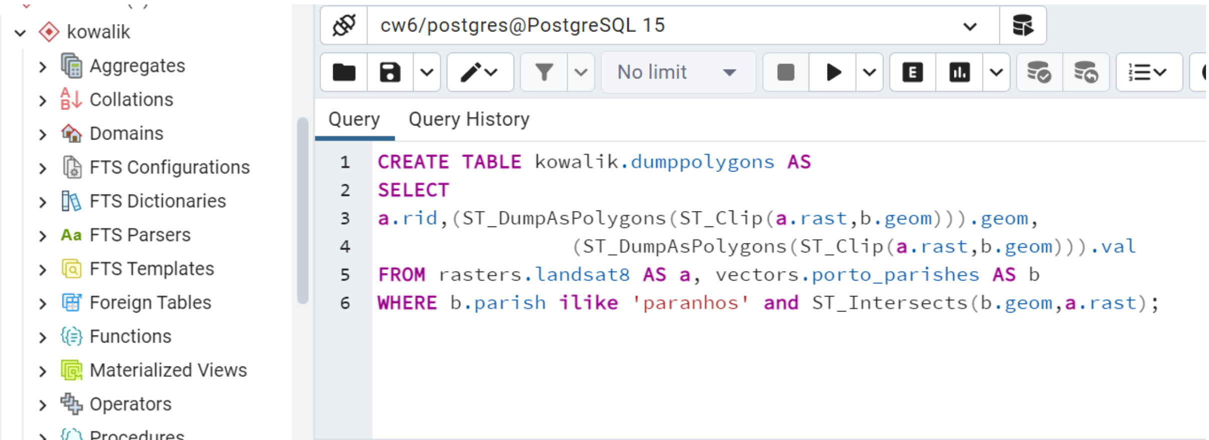
Przykład 1 - ST_Intersection



```
create table kowalik.intersection as
SELECT
a.rid,(ST_Intersection(b.geom,a.rast)).geom,(ST_Intersection(b.geom,a.rast)
).val
FROM rasters.landsat8 AS a, vectors.porto_parishes AS b
WHERE b.parish ilike 'paranhos' and ST_Intersects(b.geom,a.rast);
```

```
SELECT 6649

Query returned successfully in 2 secs 871 msec.
```

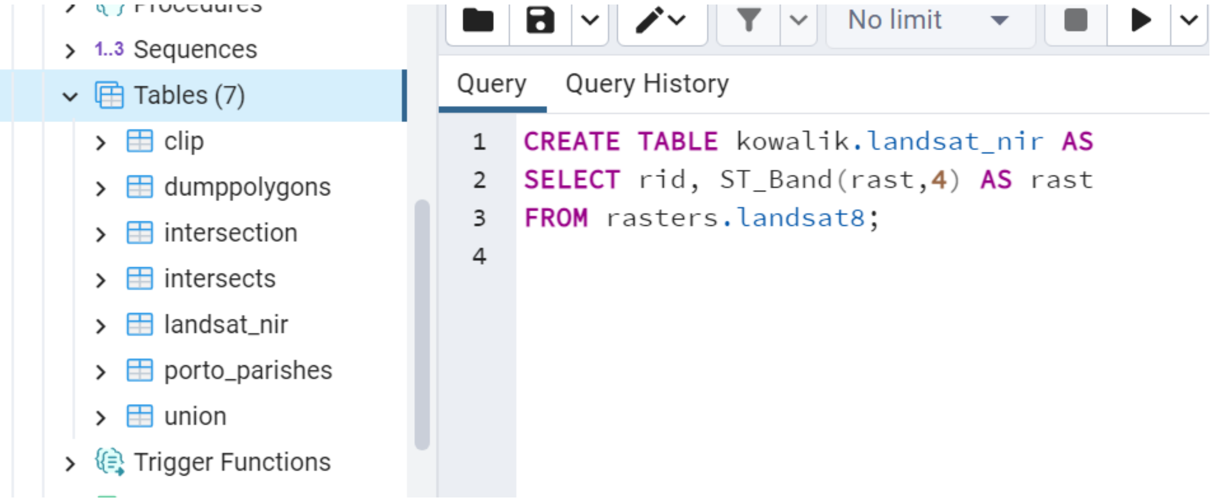
Przykład 2 - ST_DumpAsPolygons



```
CREATE TABLE kowalik.dumppolygons AS
SELECT
a.rid,(ST_DumpAsPolygons(ST_Clip(a.rast,b.geom))).geom,
                  (ST_DumpAsPolygons(ST_Clip(a.rast,b.geom))).val
FROM rasters.landsat8 AS a, vectors.porto_parishes AS b
WHERE b.parish ilike 'paranhos' and ST_Intersects(b.geom,a.rast);
```

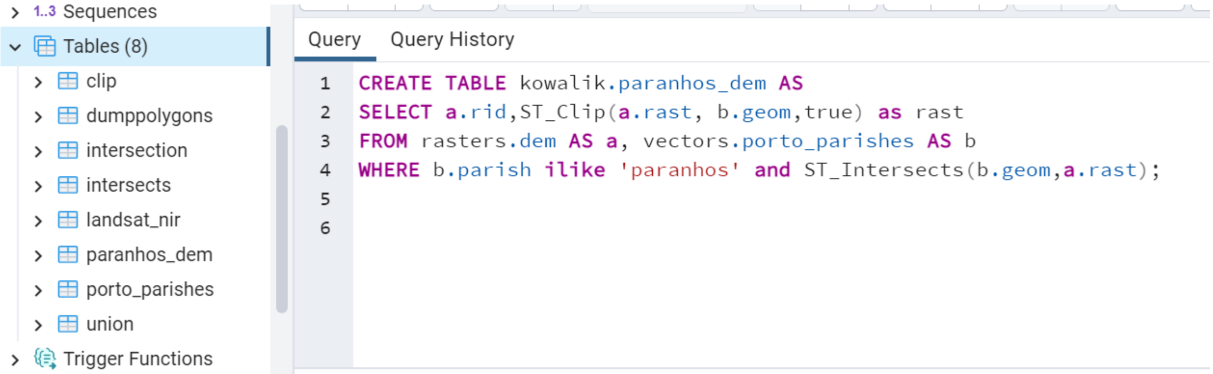
Analiza rastrów

Przykład 1 - ST_Band



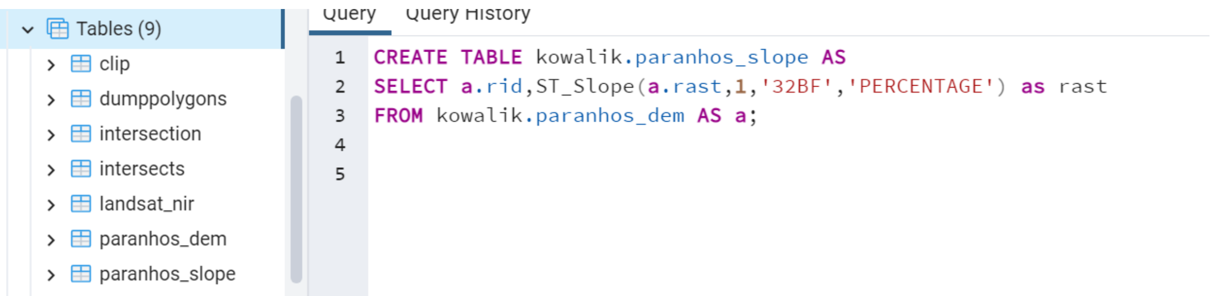
```sql
CREATE TABLE kowalik.landsat_nir AS
SELECT rid, ST_Band(rast,4) AS rast
FROM rasters.landsat8;
```

Przykład 2 - ST_Clip



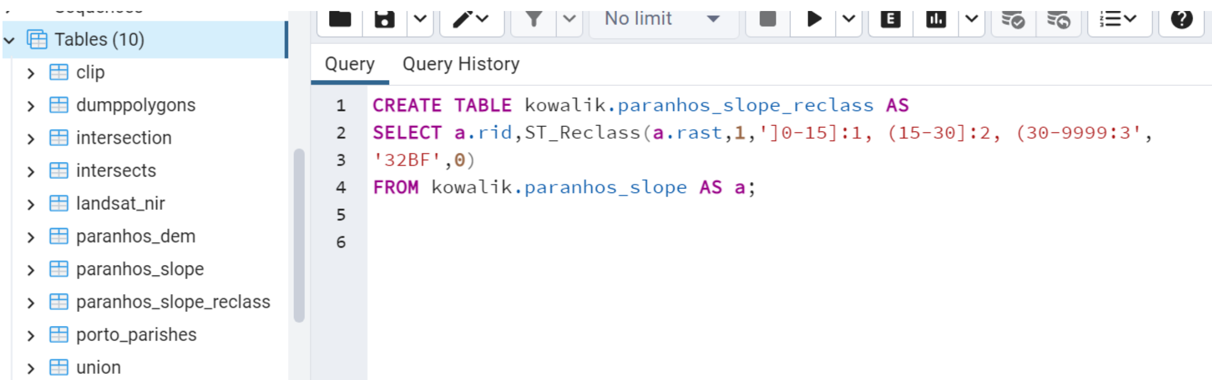
```sql
CREATE TABLE kowalik.paranhos_dem AS
SELECT a.rid,ST_Clip(a.rast, b.geom,true) as rast
FROM rasters.dem AS a, vectors.porto_parishes AS b
WHERE b.parish ilike 'paranhos' and ST_Intersects(b.geom,a.rast);
```

Przykład 3 - ST_Slope



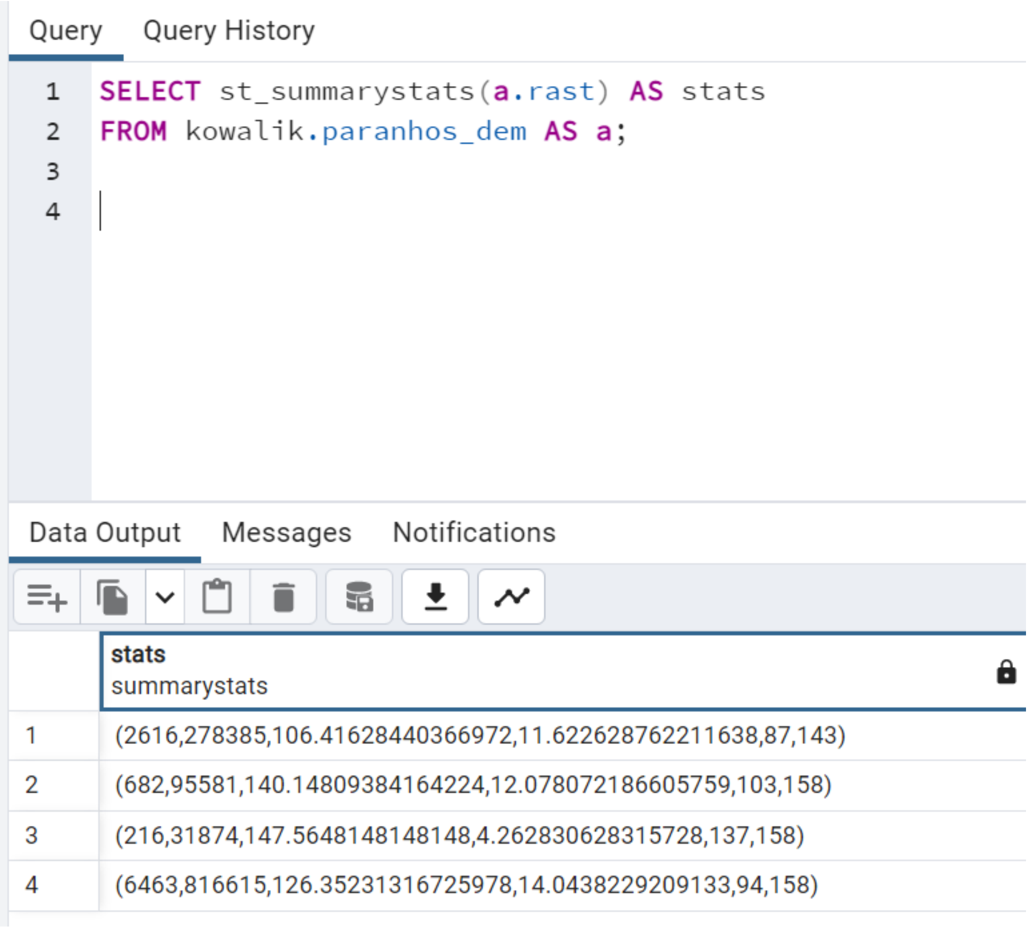
```sql
CREATE TABLE kowalik.paranhos_slope AS
SELECT a.rid,ST_Slope(a.rast,1,'32BF','PERCENTAGE') as rast
FROM kowalik.paranhos_dem AS a;
```

Przykład 4 - ST_Reclass



```sql
CREATE TABLE kowalik.paranhos_slope_reclass AS
SELECT a.rid,ST_Reclass(a.rast,1,']0-15]:1, (15-30]:2, (30-9999:3',
'32BF',0)
FROM kowalik.paranhos_slope AS a;
```

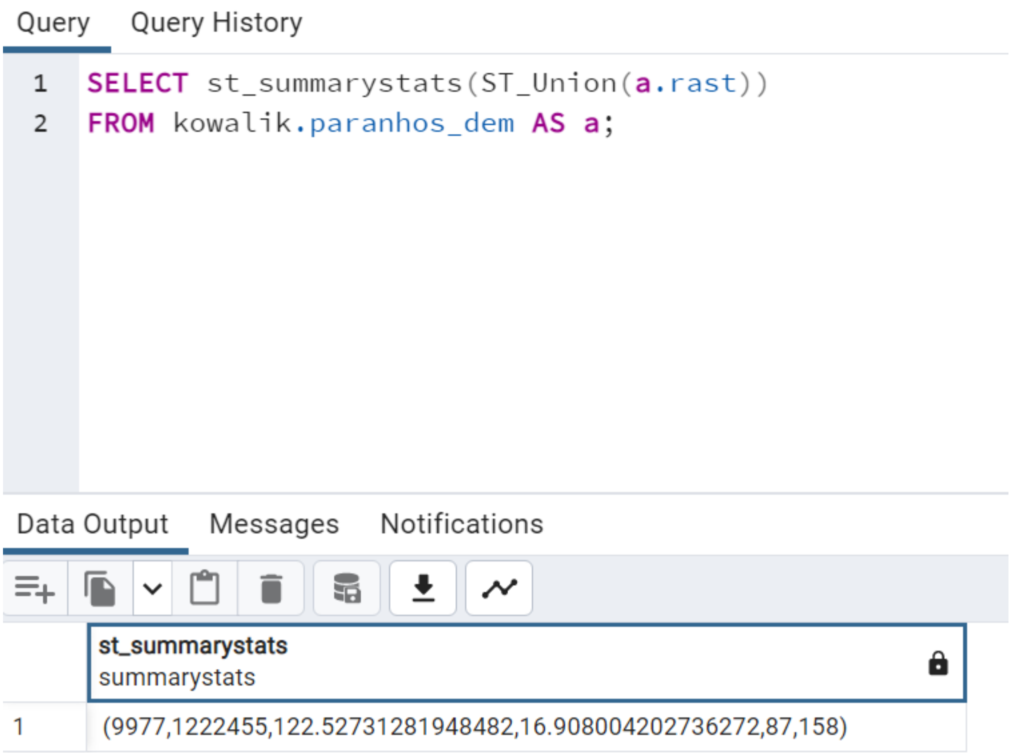
Przykład 5 - ST_SummaryStats



```sql
SELECT st_summarystats(a.rast) AS stats
FROM kowalik.paranhos_dem AS a;

```

	stats summarystats
1	(2616,278385,106.41628440366972,11.622628762211638,87,143)
2	(682,95581,140.14809384164224,12.078072186605759,103,158)
3	(216,31874,147.5648148148148,4.262830628315728,137,158)
4	(6463,816615,126.35231316725978,14.0438229209133,94,158)

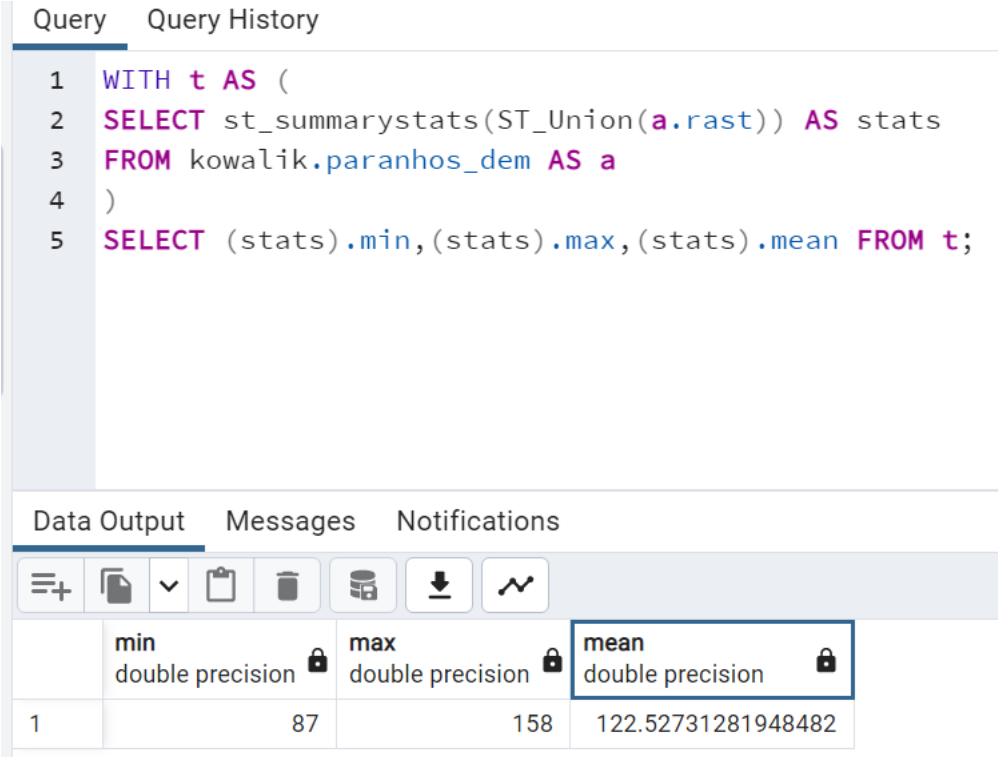
Przykład 6 - ST_SummaryStats oraz Union



```sql
SELECT st_summarystats(ST_Union(a.rast))
FROM kowalik.paranhos_dem AS a;
```

	st_summarystats summarystats
1	(9977,1222455,122.52731281948482,16.908004202736272,87,158)

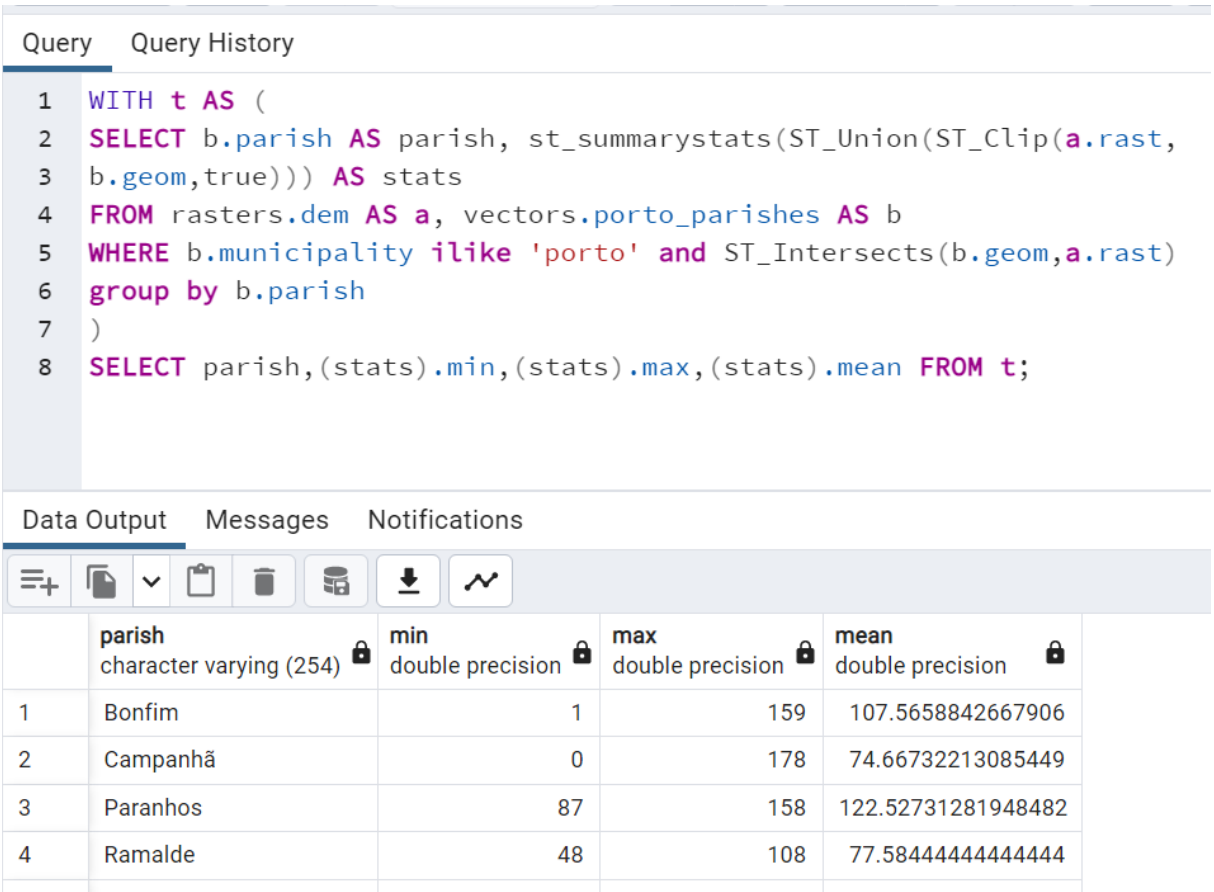
Przykład 7 - ST_SummaryStats z lepszą kontrolą złożonego typu danych



```
WITH t AS (
SELECT st_summarystats(ST_Union(a.rast)) AS stats
FROM kowalik.paranhos_dem AS a
)
SELECT (stats).min,(stats).max,(stats).mean FROM t;
```

	min double precision	max double precision	mean double precision
1	87	158	122.52731281948482

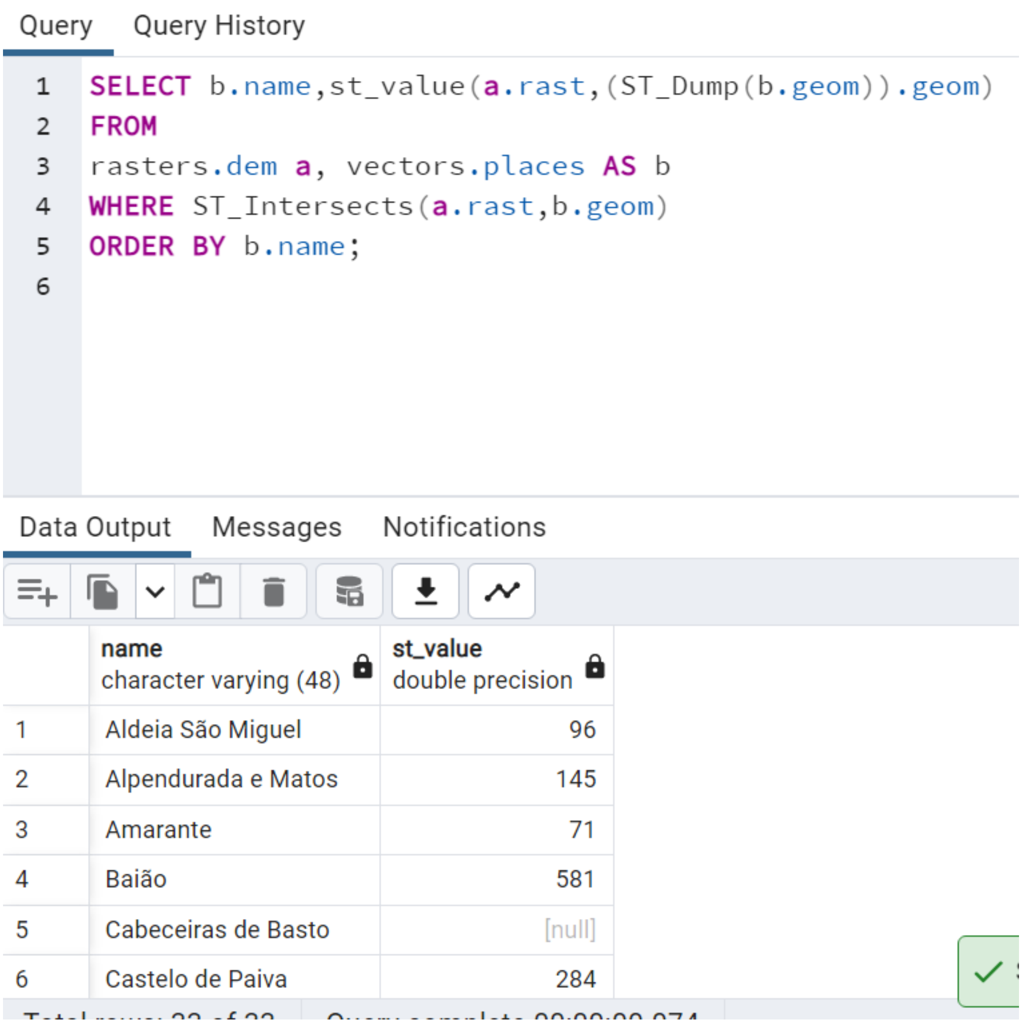
Przykład 8 - ST_SummaryStats w połączeniu z GROUP BY



```
WITH t AS (
SELECT b.parish AS parish, st_summarystats(ST_Union(ST_Clip(a.rast,
b.geom,true))) AS stats
FROM rasters.dem AS a, vectors.porto_parishes AS b
WHERE b.municipality ilike 'porto' and ST_Intersects(b.geom,a.rast)
group by b.parish
)
SELECT parish,(stats).min,(stats).max,(stats).mean FROM t;
```

	parish character varying (254)	min double precision	max double precision	mean double precision
1	Bonfim	1	159	107.5658842667906
2	Campanhã	0	178	74.66732213085449
3	Paranhos	87	158	122.52731281948482
4	Ramalde	48	108	77.58444444444444

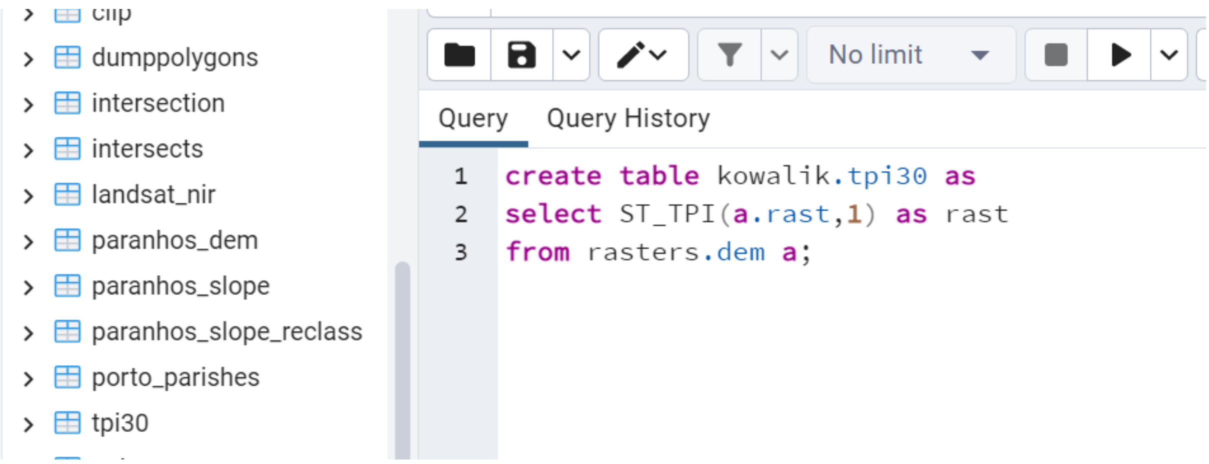
Przykład 9 - ST_Value



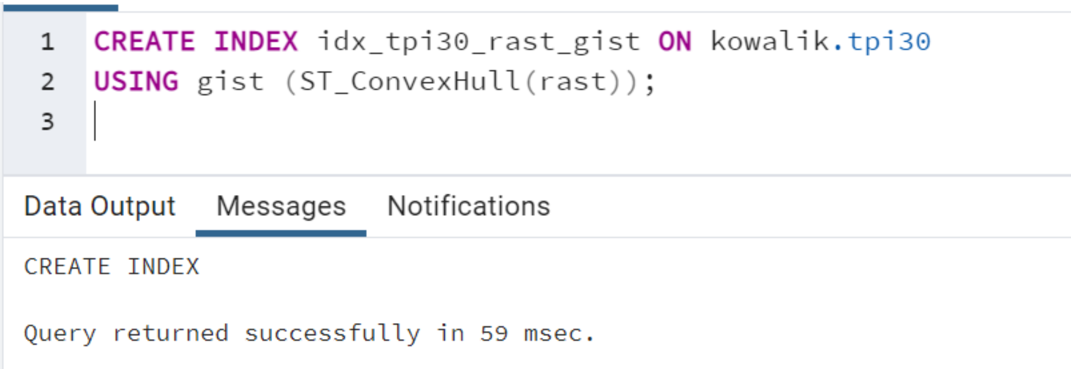
```sql
SELECT b.name,st_value(a.rast,(ST_Dump(b.geom)).geom)
FROM
rasters.dem a, vectors.places AS b
WHERE ST_Intersects(a.rast,b.geom)
ORDER BY b.name;
```

	name character varying (48)	st_value double precision
1	Aldeia São Miguel	96
2	Alpendurada e Matos	145
3	Amarante	71
4	Baião	581
5	Cabeceiras de Basto	[null]
6	Castelo de Paiva	284

Przykład 10 - ST_TPI

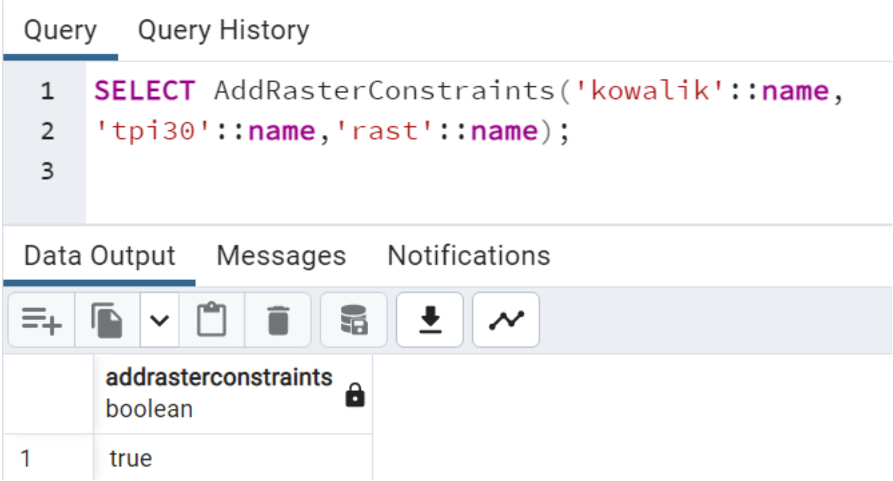


```sql
create table kowalik.tpi30 as
select ST_TPI(a.rast,1) as rast
from rasters.dem a;
```



```sql
CREATE INDEX idx_tpi30_rast_gist ON kowalik.tpi30
USING gist (ST_ConvexHull(rast));
```

```
CREATE INDEX

Query returned successfully in 59 msec.
```

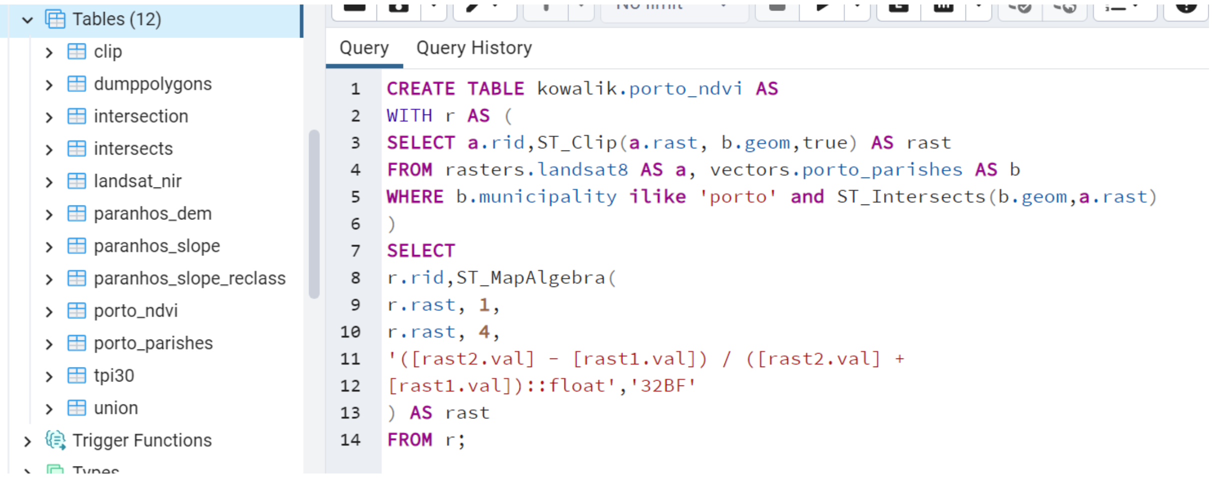


```sql
SELECT AddRasterConstraints('kowalik'::name,
'tpi30'::name,'rast'::name);
```

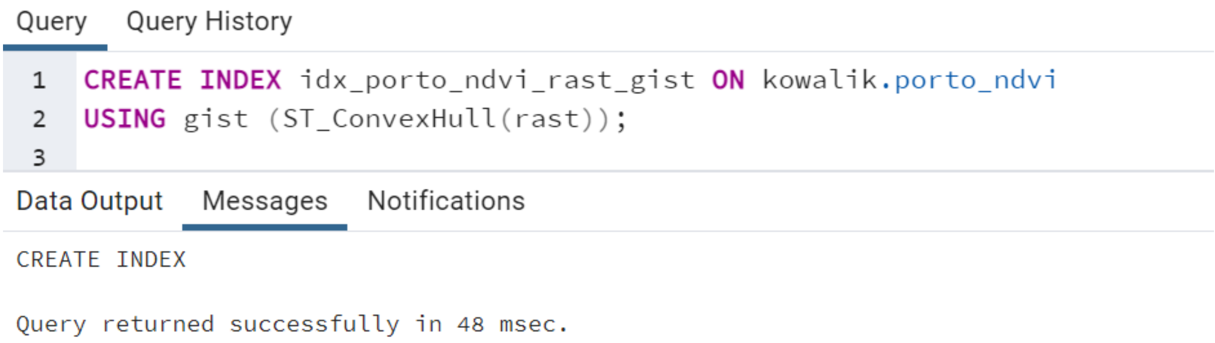
```
   addrasterconstraints
   boolean
1  true
```

Algebra map

Przykład 1 - Wyrażenie Algebry Map

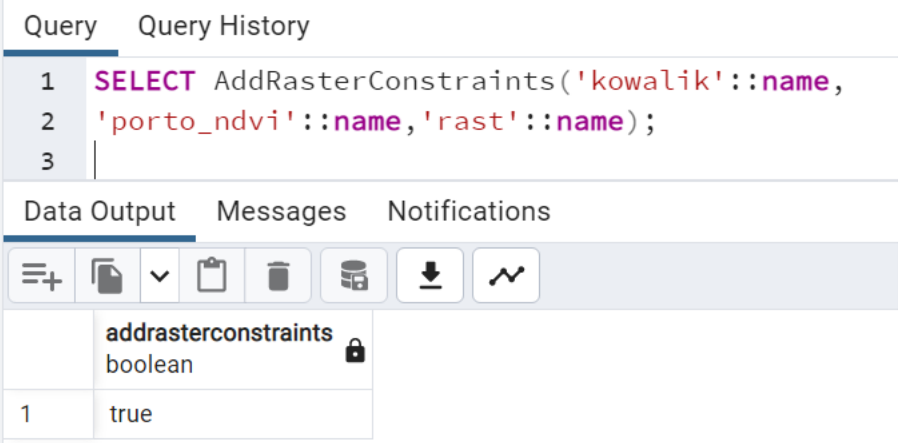


```sql
CREATE TABLE kowalik.porto_ndvi AS
WITH r AS (
SELECT a.rid,ST_Clip(a.rast, b.geom,true) AS rast
FROM rasters.landsat8 AS a, vectors.porto_parishes AS b
WHERE b.municipality ilike 'porto' and ST_Intersects(b.geom,a.rast)
)
SELECT
r.rid,ST_MapAlgebra(
r.rast, 1,
r.rast, 4,
'([rast2.val] - [rast1.val]) / ([rast2.val] +
[rast1.val])::float','32BF'
) AS rast
FROM r;
```



```sql
CREATE INDEX idx_porto_ndvi_rast_gist ON kowalik.porto_ndvi
USING gist (ST_ConvexHull(rast));
```

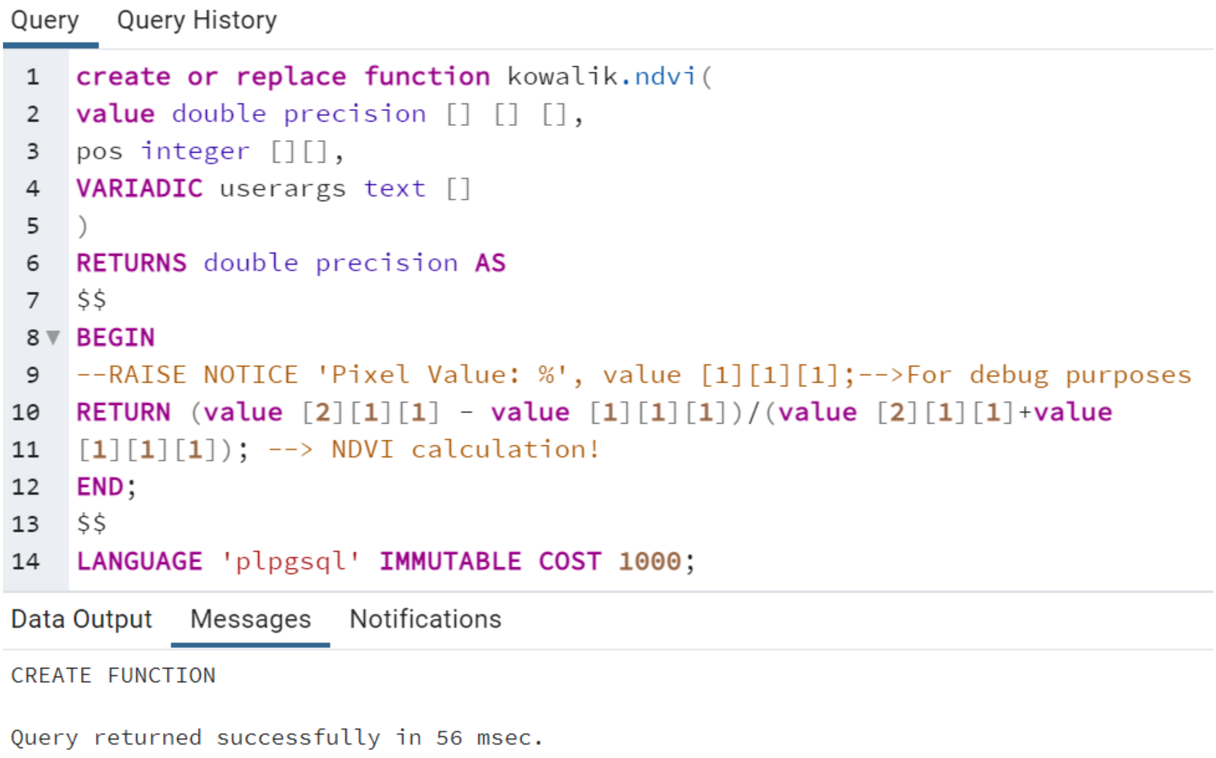
```
CREATE INDEX

Query returned successfully in 48 msec.
```



```sql
SELECT AddRasterConstraints('kowalik'::name,
'porto_ndvi'::name,'rast'::name);
```

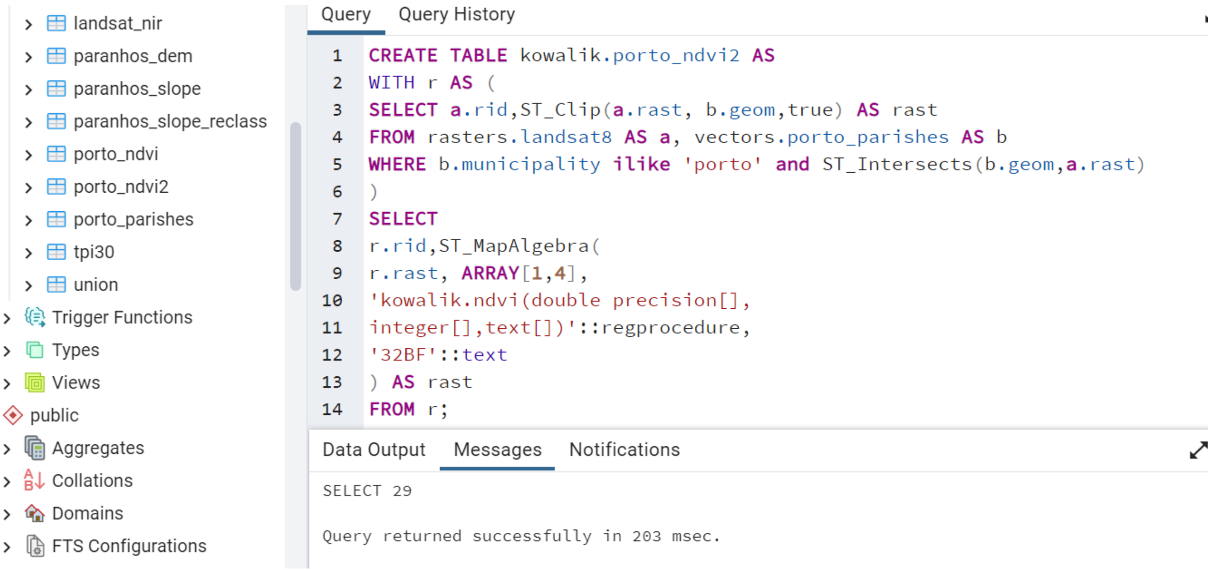
```
   addrasterconstraints
   boolean
1  true
```

Przykład 2 – Funkcja zwrotna



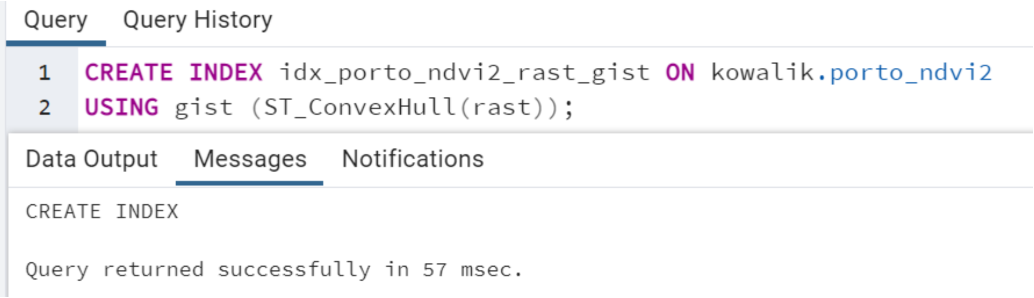
```
create or replace function kowalik.ndvi(
value double precision [] [] [],
pos integer [][],
VARIADIC userargs text []
)
RETURNS double precision AS
$$
BEGIN
--RAISE NOTICE 'Pixel Value: %', value [1][1][1];-->For debug purposes
RETURN (value [2][1][1] - value [1][1][1])/(value [2][1][1]+value
[1][1][1]); --> NDVI calculation!
END;
$$
LANGUAGE 'plpgsql' IMMUTABLE COST 1000;
```

```
CREATE FUNCTION

Query returned successfully in 56 msec.
```



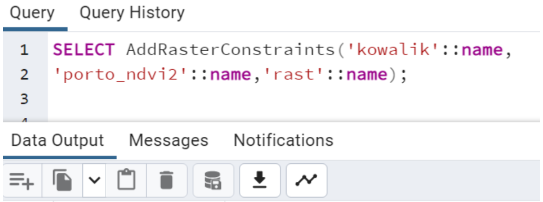
```
CREATE TABLE kowalik.porto_ndvi2 AS
WITH r AS (
SELECT a.rid,ST_Clip(a.rast, b.geom,true) AS rast
FROM rasters.landsat8 AS a, vectors.porto_parishes AS b
WHERE b.municipality ilike 'porto' and ST_Intersects(b.geom,a.rast)
)
SELECT
r.rid,ST_MapAlgebra(
r.rast, ARRAY[1,4],
'kowalik.ndvi(double precision[],
integer[],text[])'::regprocedure,
'32BF'::text
) AS rast
FROM r;
```

```
SELECT 29

Query returned successfully in 203 msec.
```



```
CREATE INDEX idx_porto_ndvi2_rast_gist ON kowalik.porto_ndvi2
USING gist (ST_ConvexHull(rast));
```

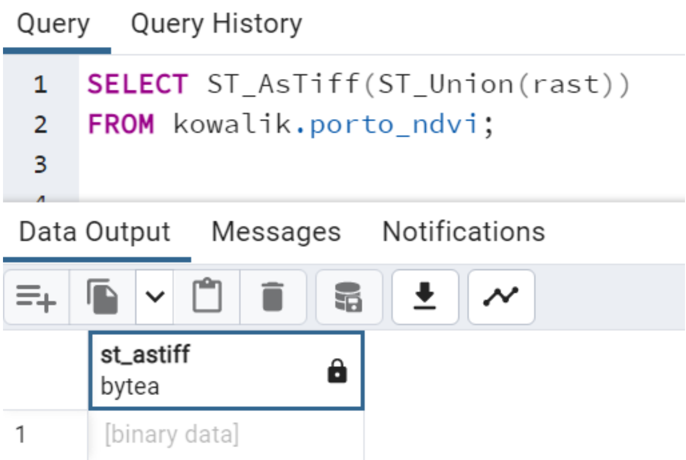
```
CREATE INDEX

Query returned successfully in 57 msec.
```



```
SELECT AddRasterConstraints('kowalik'::name,
'porto_ndvi2'::name,'rast'::name);
```

Eksport danych

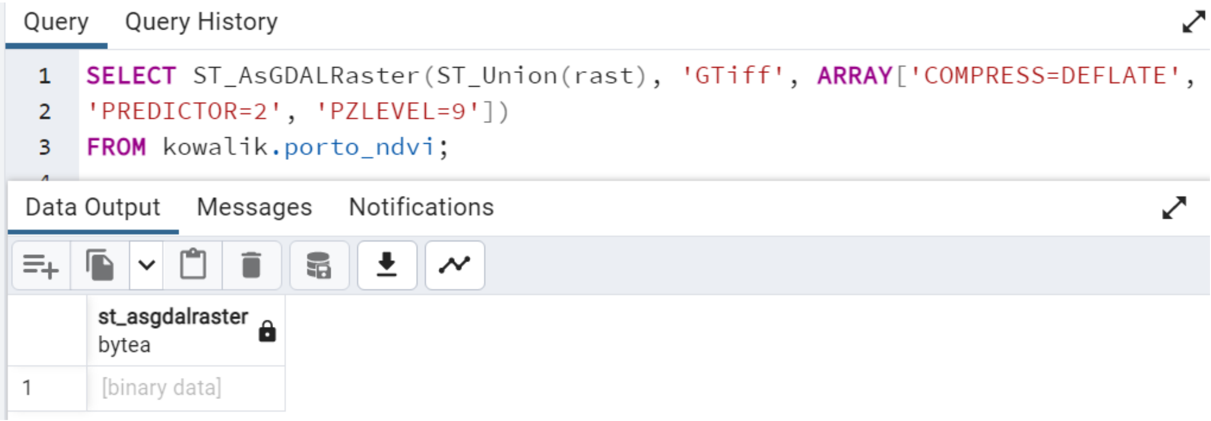
Przykład 1 - ST_AsTiff



```sql
SELECT ST_AsTiff(ST_Union(rast))
FROM kowalik.porto_ndvi;
```

```
st_astiff
bytea
1   [binary data]
```

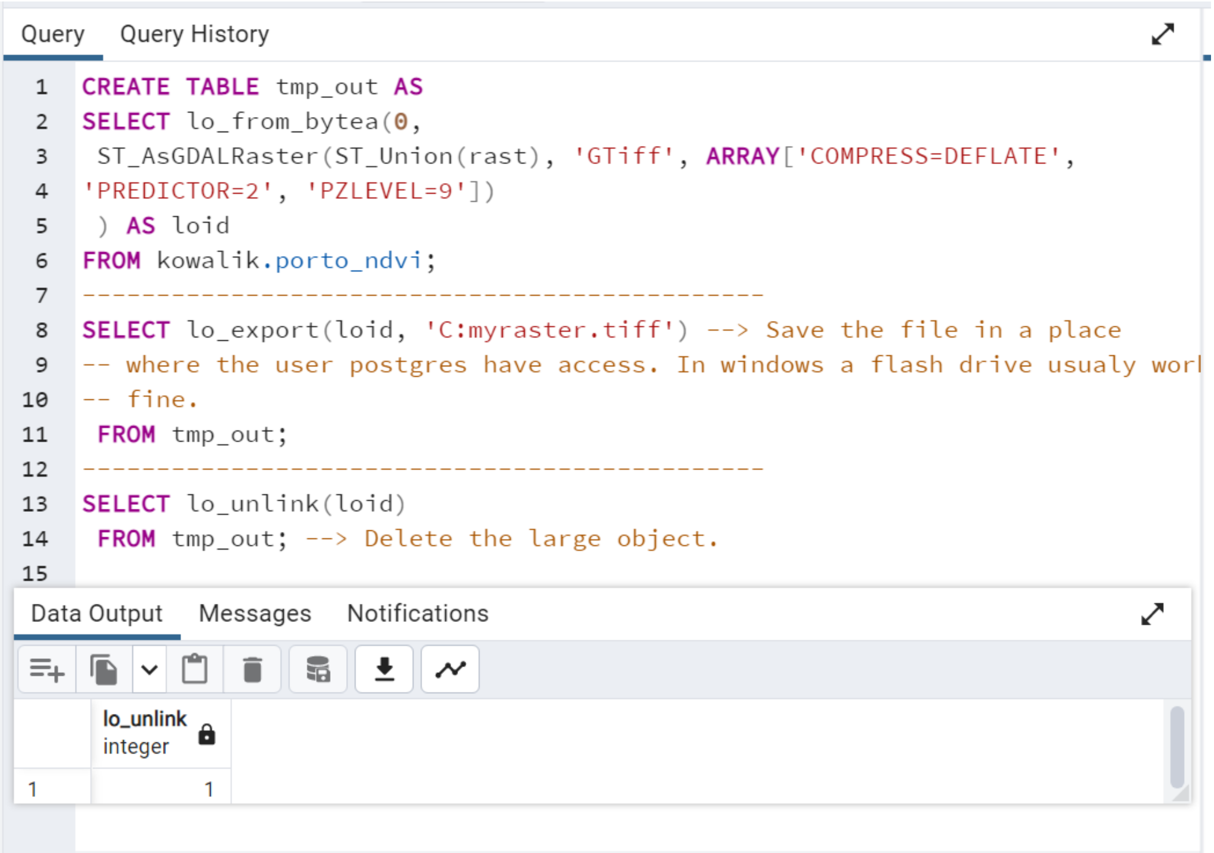
Przykład 2 - ST_AsGDALRaster



```sql
SELECT ST_AsGDALRaster(ST_Union(rast), 'GTiff', ARRAY['COMPRESS=DEFLATE',
'PREDICTOR=2', 'PZLEVEL=9'])
FROM kowalik.porto_ndvi;
```

```
st_asgdalraster
bytea
1   [binary data]
```

Przykład 3 - Zapisywanie danych na dysku za pomocą dużego obiektu (large object, lo)



```sql
CREATE TABLE tmp_out AS
SELECT lo_from_bytea(0,
 ST_AsGDALRaster(ST_Union(rast), 'GTiff', ARRAY['COMPRESS=DEFLATE',
'PREDICTOR=2', 'PZLEVEL=9'])
 ) AS loid
FROM kowalik.porto_ndvi;
----------------------------------------------
SELECT lo_export(loid, 'C:myraster.tiff') --> Save the file in a place
-- where the user postgres have access. In windows a flash drive usualy worl
-- fine.
 FROM tmp_out;
----------------------------------------------
SELECT lo_unlink(loid)
 FROM tmp_out; --> Delete the large object.
```

```
lo_unlink
integer
1          1
```