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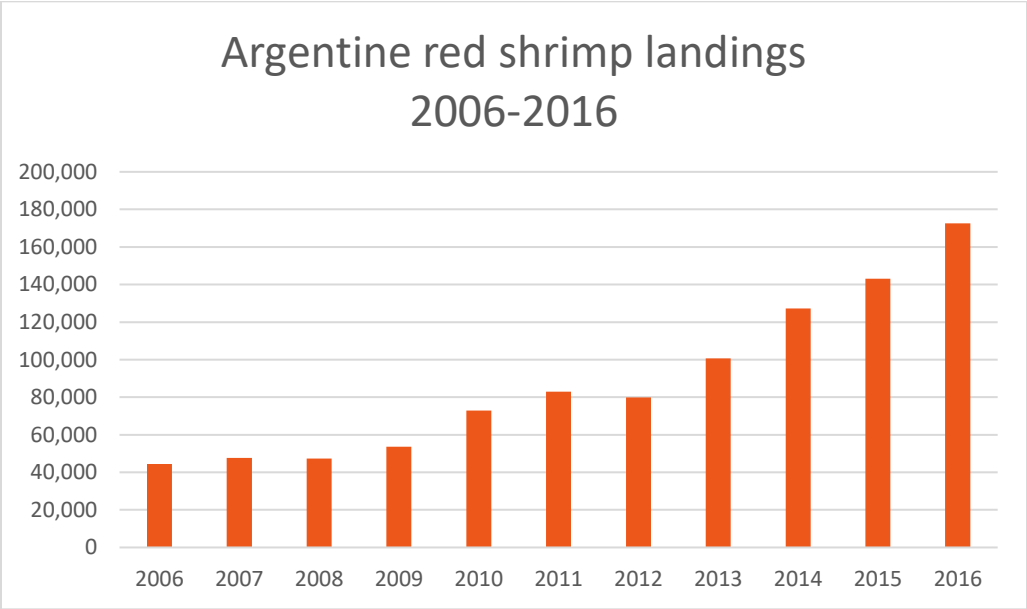
Preliminary indicators of the evolution of the Argentine red shrimp stock

During the last 7 years, Argentine red shrimp landings have been increasing year by year at an amazing rate (see Graph 1).

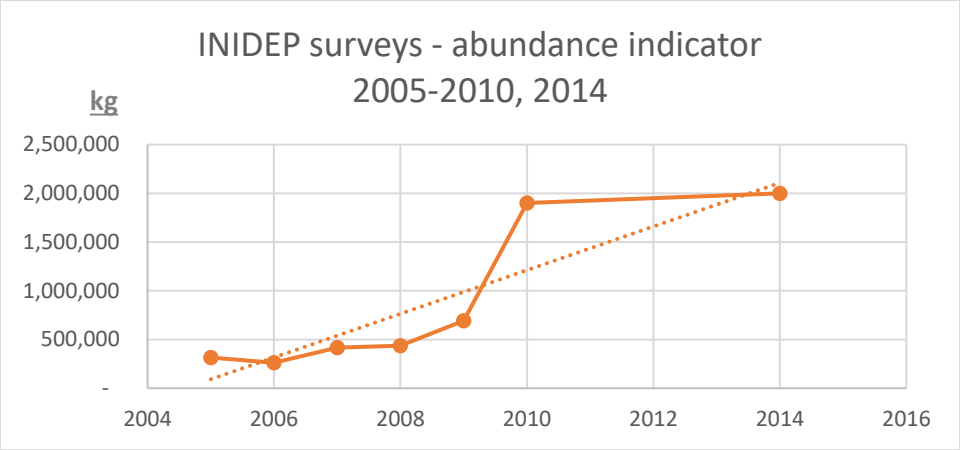


Graph 1. Argentine red shrimp landings (metric tons) 2006-2016. Source: Undersecretariat of Fisheries.

It is a logical concern whether this increase is a consequence of an increased biomass, or, on the contrary, the product of an increased exploitation rate that could endanger the sustainability of the stock.

Unfortunately, there is not an official answer to this question, and abundance estimations provided by the Argentine National Fisheries Research and Development Institute (INIDEP) have been irregular during that period.

Nevertheless, there is some scattered information in INIDEP's technical reports that allows for an analysis of the evolution of the biomass. This information has been compiled and synthesized by CeDePesca into Graph 2, referred to a biomass estimation at the beginning of some of the last eleven fishing seasons.

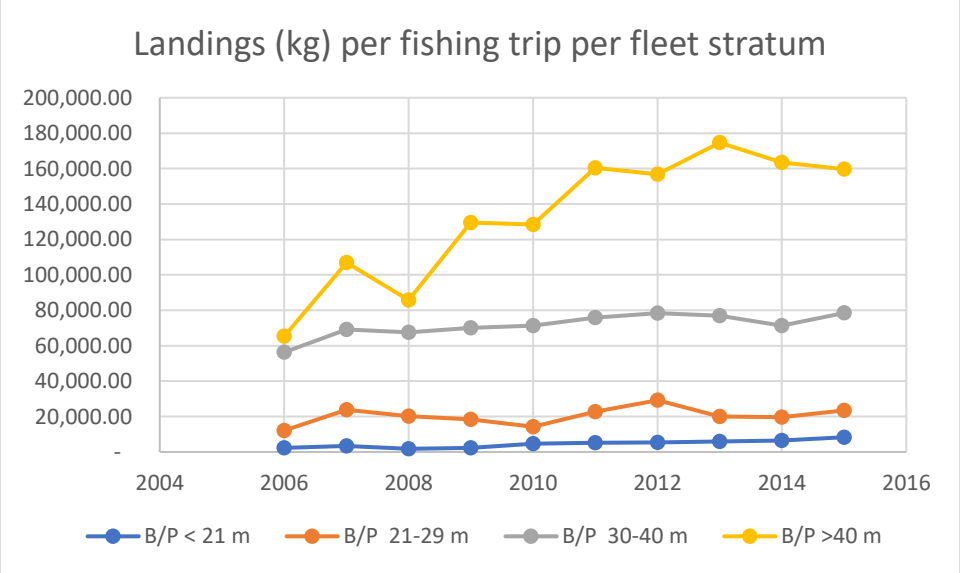


Graph 2. Argentine red shrimp biomass (kilograms) 2005-2010, 2014. Source: CeDePesca, based on INIDEP reports.

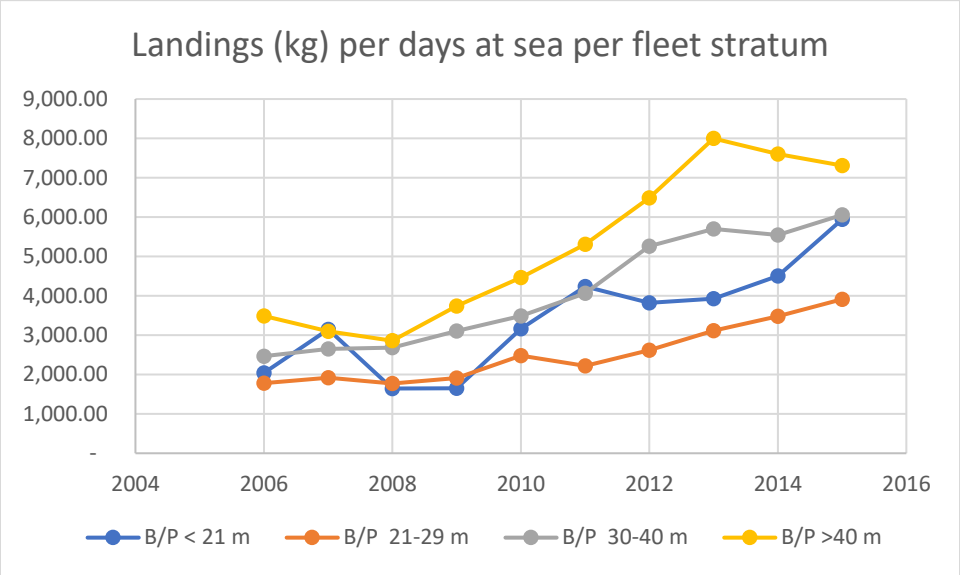
Even if this direct estimator, extracted from INIDEP swept area surveys, does not match well with the evolution of landings, it evidently shows a progressive increase of biomass since 2006, and a strong increase since 2010, which coincides with the time when landings started to increase too.

Final annual reports of the fishery provided by INIDEP also allow for the conduction of an analysis of indirect indicators, such as annual Catch per Unit of Effort (CPUE) per fleet stratum.

These reports, since 2006, provide information of landings, quantity of fishing trips and quantity of days at sea per fleet stratum that can be combined to see the evolution of the efficiency of the fishery. CeDePesca has extracted data from each final annual report to provide an illustration of this evolution (Graphs 3 and 4):



Graph 3. Landings (kilograms) per fishing trip per fleet stratum. 2006-2015. CeDePesca based on INIDEP annual reports.

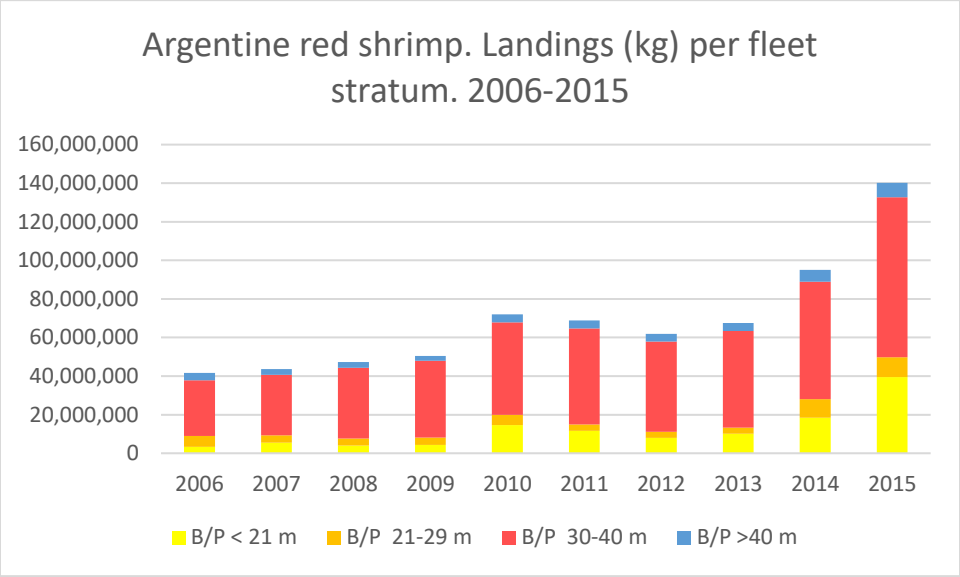


Graph 4. Argentine red shrimp CPUE (kilograms per day at sea). 2006-2015. Source: CeDePesca based on INIDEP annual reports.

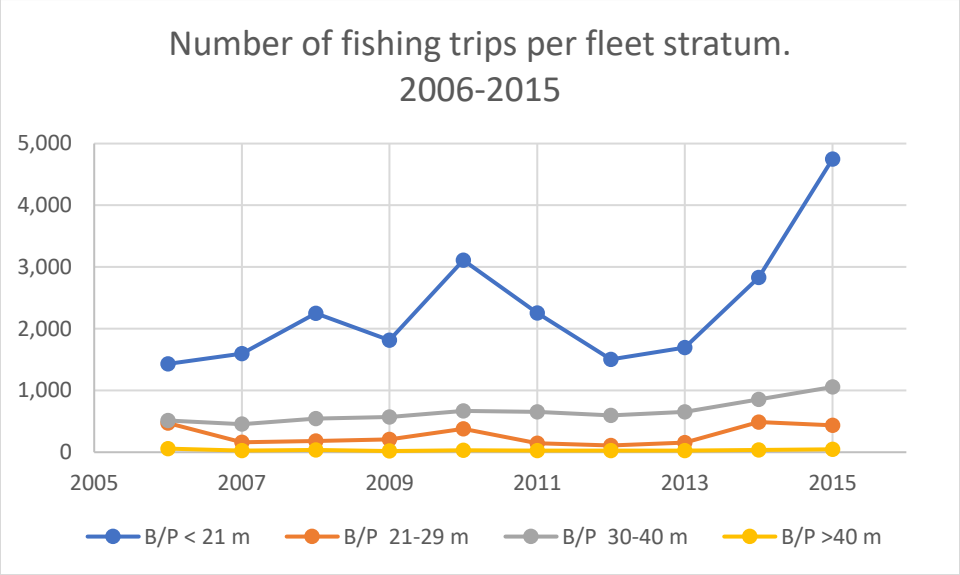
Interestingly, except for the major fleet, whose landings are not very significant (see Graph 5), landings per fishing trip have remain steady (Graph 3), but landings per day at sea have increased (Graph 4) following the trend of landings (Graph 5). This means that (except in the case of vessels larger than 40 m length), most of the boats have been coming back to harbor with full holds, but these trips, for fishing boats larger than 30 m, have been shorter each year, allowing for more trips (see Table 1 and Graph 6).

Days at sea per fishing trip				
	B/P < 21 m	B/P 21-29 m	B/P 30-40 m	B/P >40 m
2006	1.13	6.82	22.81	18.72
2007	1.09	12.45	26.05	34.46
2008	1.08	11.38	25.11	30.00
2009	1.42	9.62	22.55	34.63
2010	1.48	5.71	20.46	28.76
2011	1.22	10.24	18.65	30.23
2012	1.39	11.14	14.90	24.16
2013	1.53	6.44	13.48	21.83
2014	1.44	5.64	12.86	21.49
2015	1.40	6.01	12.96	21.85

Table 1. Days at sea per fishing trip per fleet stratum 2006-2015. Source: CeDePesca based on INIDEP annual reports.



Graph 5. Argentine red shrimp landings (kilograms) per fleet stratum. 2006-2015. Source: CeDePesca based on INIDEP annual reports.

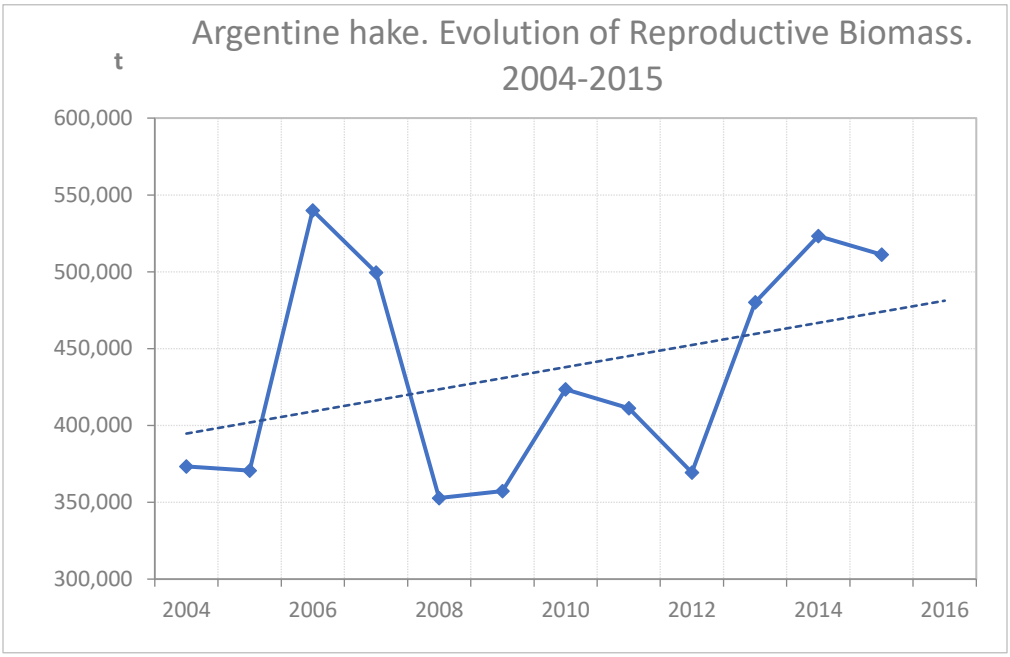


Graph 6. Fishing effort (number of fishing trips) per fleet stratum. 2006-2015. Source: CeDePesca based on INIDEP annual reports.

In conclusion: Given that fishing effort, CPUE and landings have all increased together, we can deduce that the increase of fishing effort has accompanied the increase of abundance. This is coincident with the trend observed in fishery-independent surveys that the INIDEP has been conducting, even if very irregularly.

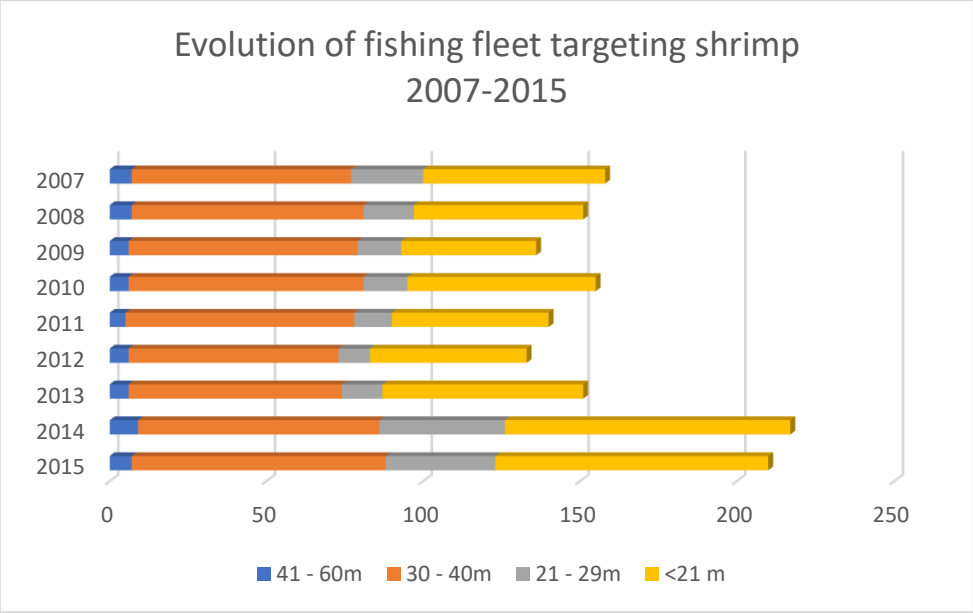
As this resource has a short span life and behaves as a single annual cohort, it is highly dependent of the environmental conditions and its changes. Even if, in the past, a hypothesis regarding a negative correlation between the decreasing hake abundance and the increasing shrimp abundance

had been circulating, it can be observed that in recent years both have increased (See Graph 7). Therefore, the cause for shrimp abundance increase must be mainly environmental.



Graph 7. Evolution of Argentine hake reproductive biomass. 2004-2015. Source: INIDEP

Verifying the abundance increase of Argentine red shrimp still does not allow to understand where the roof for such increase might be, and what is the biologically optimum exploitation point. This lack of understanding creates the obligation to follow these indicators very closely to avoid the over-exploitation of the resource and the consequent collapse of such profitable activity. This is particularly important having in mind the recent increase of the fleet targeting shrimp (See Graph 8).



Graph 8. Fishing effort (number of boats) per fleet stratum. 2007-2015. Source: INIDEP.

To refine the fishery's management, and considering that this resource shows annual cohorts, we advise the calculation of a weekly CPUE series (ideally standardized CPUEs) to define a limit reference point for the annual season, together with a fishery-independent indicator provided by INIDEP surveys, and having the ratio hake/shrimp as a threshold and a trigger for mitigation measures and even for the closure of the fishery.

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